



Massachusetts Department of
ELEMENTARY & SECONDARY
EDUCATION

*Release of
Spring 2012
MCAS Test Items*

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**Massachusetts Department of
Elementary and Secondary Education**



This document was prepared by the
Massachusetts Department of Elementary and Secondary Education
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Commissioner

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Commissioner's Foreword

Dear Colleagues:

The Massachusetts Department of Elementary and Secondary Education is committed to working in partnership with schools to support a system that will prepare all students to succeed as productive and contributing members of our democratic society and the global economy. To assist in achieving this goal, the Department regularly releases Massachusetts Comprehensive Assessment System (MCAS) test items to provide information about the kinds of knowledge and skills that students are expected to demonstrate.

This publication contains all MCAS test items on which student scores are based for grade 10 English Language Arts and Mathematics tests and for high school Biology, Chemistry, Introductory Physics, and Technology/Engineering tests. This document also contains approximately 50% of common test items from spring 2012 MCAS tests in grades 3–8.

The Department has banked thousands of MCAS items that are currently posted on the Department website. These items, which are available at www.doe.mass.edu/mcas/testitems.html, will continue to be a rich resource for schools.

This publication is available only on the Department website. The released test items for individual subjects at each grade level can be printed from this site. I encourage educators to use the relevant sections of this document together with their test item analysis reports as guides for planning changes in curriculum and instruction that may be needed to support schools and districts in their efforts to improve student performance.

Thank you for your support as we work together to strengthen education for our students in Massachusetts.

Sincerely,

Mitchell D. Chester, Ed.D.

Commissioner of Elementary and Secondary Education

I. Document Purpose and Structure

Document Purpose and Structure

Purpose

The purpose of this document is to share with educators and the public spring 2012 test items on which student results are based. Local educators will be able to use this information to identify strengths and weaknesses in their curriculum and instruction and to plan instruction to more effectively meet their students' individual needs.

This document is also intended to be used by school and district personnel as a companion document to test item analysis reports. The reports list, for the school accessing the report, the names of all enrolled students in the grade covered by the report as well as information about how each student answered each item contained in this document. Each report also labels each item as multiple-choice, open-response, short-response, short-answer, or writing prompt and identifies the item's MCAS reporting category. Item numbers in this document correlate directly to the "Item Numbers" in the test item analysis reports. Like last year, reports for grades 3–8 will indicate whether students responded correctly or incorrectly to 2012 MCAS common items that are not included in this document; reports will not indicate the correct responses to unreleased items. Reporting categories and framework standards assessed by unreleased 2012 MCAS common items are included in a table at the conclusion of each chapter for grades 3–8 in this document.

New for 2012, some reports for grades 3–8 ELA and Mathematics will also display information about how items on the 2012 tests can be assigned to standards in the 2011 Massachusetts Curriculum Frameworks. More information about the transition of MCAS to the standards in the 2011 Frameworks is available on the Department website at www.doe.mass.edu/mcas/transition.

Structure

Each subsequent chapter of this document contains information and materials for one MCAS test (one grade level and one content area). For example, chapter II contains information for the grade 3 ELA Reading Comprehension test; chapter XV contains information for the grade 10 Mathematics test. Note that chapters III, VI, and VIII contain information for both the ELA Composition (Part A) and the ELA Reading Comprehension (Part B) tests for the relevant grade.

Beginning with chapter II, each chapter has three main sections. The **first section** introduces the chapter by listing the Massachusetts curriculum framework content strands assessed by MCAS in that chapter's content area. These content strands are identical to the MCAS reporting categories under which test results are reported to schools and districts. The first section also provides the Web address for the relevant

framework and the page numbers on which the learning standards assessed by the test items in the chapter can be found. In addition, there is a brief overview of the test (number of test sessions, types of items, reference materials allowed, and cross-referencing information).

For grades 3–8, the **second section** of each chapter contains approximately half of each content area’s common test items used to generate spring 2012 MCAS student results. The second section of each chapter for grade 10 ELA and Mathematics tests and high school Biology, Chemistry, Introductory Physics, and Technology/Engineering tests contains all of the common items on which spring 2012 MCAS student results are based. With the exception of the ELA Composition writing prompts, the test questions in this document are shown in the same order and basic format in which they were presented in the test booklets. The Mathematics Tool Kit pieces used by students to answer released items in grades 3 and 4, as well as the Mathematics Reference Sheets used by students in grades 5, 6, 7, 8, and 10 Mathematics test sessions are inserted immediately following the last question in each Mathematics chapter. Students were provided with a plastic ruler during the grades 3–8 Mathematics tests and the high school Technology/Engineering test. An image of the ruler is not presented in this document. The reference tools used by students during the high school Science and Technology/Engineering tests (Chemistry Formula and Constants Sheet/Periodic Table of the Elements for the Chemistry test; formula sheets for the Introductory Physics and Technology/Engineering tests) are inserted immediately following the last question in the second section of the associated chapter.

Due to copyright restrictions, certain English Language Arts reading passages are not available on the Department’s website. Copyright information for all released common reading passages is provided in the document. Note that the Department has obtained permission to post all ELA passages that appear on its website. While the Department grants permission to use the posted test items for educational purposes, it cannot grant or transfer permission to use the passages that accompany the items. Such permission must be obtained directly from the holder of the copyright. For further information, contact Student Assessment Services at 781-338-3625.

The **final section** of each chapter is a table that cross-references each released common item with its MCAS reporting category and with the framework standard it assesses. Correct answers to released multiple-choice questions and Mathematics tests released short-answer questions are also listed in the table. For grades 3–8, this section also includes a table that cross-references each unreleased common item with its MCAS reporting category and with the framework standard it assesses.

Responses to short-response questions, open-response questions, and compositions written in response to writing prompts are scored individually. An overview of procedures for scoring these responses and compositions is presented in the MCAS Frequently Asked Questions, which are available on the Department’s website at www.doe.mass.edu/mcas/overview.html. Sample student responses and compositions from previous MCAS administrations may also be viewed on the Department’s website.

Materials presented in this document are **not** formatted **exactly** as they appeared in student test booklets. For example, in order to present items most efficiently in this document, the following modifications have been made:

- Some fonts and/or font sizes may have been changed and/or reduced.
- Some graphics may have been reduced in size from their appearance in student test booklets; however, they maintain the same proportions in each case.
- For grades 7 and 10, the ELA Composition writing prompt is presented on the same page as the make-up writing prompt, and the four lined pages provided for students' initial drafts are omitted.
- All references to page numbers in answer booklets have been deleted from the directions that accompany test items.

II. English Language Arts, Reading Comprehension, Grade 3

Grade 3 English Language Arts

Reading Comprehension Test

The spring 2012 grade 3 English Language Arts Reading Comprehension test was based on learning standards in the two content strands of the Massachusetts *English Language Arts Curriculum Framework* (2001) listed below. Specific learning standards for grade 3 are found in the *Supplement to the Massachusetts English Language Arts Curriculum Framework* (2004). Page numbers for the learning standards appear in parentheses.

- Language (*Framework*, pages 19–26; *Supplement*, pages 6–7)
- Reading and Literature (*Framework*, pages 35–64; *Supplement*, pages 7–9)

The *English Language Arts Curriculum Framework* and *Supplement* are available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Reading Comprehension test results are reported under two MCAS reporting categories, **Language** and **Reading and Literature**, which are identical to the two framework content strands listed above.

Test Sessions and Content Overview

The grade 3 ELA Reading Comprehension test included two separate test sessions. Each session included reading passages, followed by multiple-choice, short-response, and/or open-response questions. Selected common reading passages and approximately half of the common test items are shown on the following pages as they appeared in grade 3 test & answer booklets.

Reference Materials

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both ELA Reading Comprehension sessions. No other reference materials were allowed during any ELA Reading Comprehension test session.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework general standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

English Language Arts

READING COMPREHENSION

DIRECTIONS

This session contains two reading selections with multiple-choice and short-response questions. For multiple-choice questions, mark your answers by filling in the circle next to the best answer. For short-response questions, write your answer in the space below the question.

When 11-year-old Skate Tate comes home from school, she finds that her Great-Uncle Mort, whose nickname is GUM, has come for a visit. Read the story to learn more about GUM's visit with Skate and her family. Then answer the questions that follow.

from **UNITED TATES of AMERICA**

by Paula Danziger

- 1 Opening the front door to my house, I call out, "Mom. I'm home."
2 She calls back, "In the kitchen. Hurry up. I have a surprise for you."
3 I rush into the kitchen, wondering what the surprise is.
4 Maybe she's made my favorite dessert, chocolate cheesecake.
5 I enter the kitchen.
6 It's not chocolate cheesecake.
7 It's even better.
8 In the chair, across from my mom, is one of my favorite people in the whole entire world.
9 I say what I always say when I see him sitting down, "Watch out, there's GUM on the chair."
10 "Okay kiddo. Skate on over here." He says what he always says when he first sees me. "Give your old Great-Uncle Mort a big hug."
11 Then I rush over to him.
12 I say, "You're not *so* old. If you were, we'd have to call you O'GUM . . . and we don't."

Reading Comprehension

13 I look at GUM.

14 He's fifty-seven years old . . . that's not old-old . . . not ancient old. He was twenty years old when my dad, his nephew, was born.

15 I hug him and ask at the same time, "When did you get here? How long are you staying? Where are you going next? Do you think you can stay here for a while?"

16 He laughs. "Slow down . . . enough questions for a minute . . . and you forgot an important one . . . one that you always asked first, when you were little."

17 I grin at him.

18 "Ask." He grins back.

19 I know which question he is talking about but now that I am older, I don't ask this anymore even though I do think it.

20 "Ask," he says. "It's okay."

21 I look at my mother, who taught us not to ask.

22 She grins, shrugs, and says, "With GUM, the rules are different. You can ask."

23 "What did you bring me? What did you bring me?" I clap my hands and jump up and down. "What did you bring me?"

24 Once I start asking, it's hard to stop.

25 GUM goes over to a suitcase, opens it up, and pulls out a large package with my name on it. "Gifts from India."

26 The package is filled with lots of smaller packages.

27 I open one.

28 Paper . . . it's absolutely amazing. It looks like there are things in it. I touch it, smile, and think about how I'm going to use it in my artwork.

29 "It's all handmade," GUM tells me. "I visited the factory. They add things like flowers, onion skin, garlic, and fabric."

30 I open a bag filled with squares of fabric . . . silks and suedes and beautiful patterns. "Oh, GUM . . . this is wonderful! I love it. Thank you."

31 "I thought you could use it in your scrapbooks," GUM says.

32 I smile at him. I'm smiling so much that it feels like my face is going to break.

33 GUM is always interested in my artwork.

34 I remember when I was in second grade and making Popsicle stick log cabins.

Reading Comprehension

- 35 GUM and I must have eaten a gazillion pops until we realized that craft stores sold the sticks without the ices.
- 36 My Popsicle stick village was very colorful.
- 37 I open another package.
- 38 “Oh, GUM . . . these are beautiful. What are they?”
- 39 “They’re called *bindis*.” He explains, “Indian women wear them on their foreheads.”
- 40 *Bindis* . . . tiny little dots and other shapes . . . all different kinds . . . material, jewels, plastic, a mixture of all three . . . I just love them.
- 41 I open another package . . . bracelets . . . large and small.
- 42 I hold up one of the tiny ones. “Too large for a ring . . . too small for a bracelet.”
- 43 GUM and I look at each other and say at the same time, “Picture frames.”
- 44 I pass them over to my mom to look at and she says, “GUM gave some to me, too. I’m going to use them as napkin rings.”
- 45 Another package to open . . . and it’s beautiful material.
- 46 GUM says, “It’s an Indian sari, a dress.”
- 47 “Who’s sari now?” My mom sings an old song that she likes, “Who’s Sorry Now.”
- 48 GUM and I groan and cover our ears.
- 49 GUM grins at me. “The D.F. not only has the family habit of punning . . . she has the family habit of not being able to sing on key.”
- 50 GUM calls Mom The D.F., the Delicate Flower, because she doesn’t like to rough it, to camp out when we travel.
- 51 I open the last package.
- 52 Art books from India . . . the work is so beautiful.
- 53 I just keep smiling at GUM, who keeps smiling back.
- 54 I am so happy.
- 55 Even if GUM had arrived with no gifts, I would still be so happy.
- 56 Being with GUM is the best gift of all.

United Tates of America by Paula Danziger. Reprinted by arrangement with the author and Writers House LLC, acting as agent for the author.

Reading Comprehension

Mark your choices for multiple-choice questions 1 through 10 by filling in the circle next to the best answer.

1 In the story, how do readers **first** discover that GUM is special to Skate?

- Ⓐ Skate is happy that GUM thinks about her artwork.
- Ⓑ Skate is proud of a log cabin she builds with GUM.
- Ⓒ Skate is more excited about opening her presents than she is about visiting GUM.
- Ⓓ Skate is more excited about seeing GUM than she is about eating her favorite dessert.

2 In the story, which gift does Skate open **first**?

- Ⓐ an art book
- Ⓑ a new dress
- Ⓒ small bracelets
- Ⓓ handmade paper

3 Based on the story, what does Skate **most** enjoy doing in her free time?

- Ⓐ baking
- Ⓑ reading
- Ⓒ taking pictures
- Ⓓ making scrapbooks

4 Read the sentence from paragraph 32 in the box below.

I'm smiling so much that it feels like my face is going to break.

What does the sentence **mostly** show about Skate?

- Ⓐ She is so happy that she cannot stop smiling.
- Ⓑ She is so happy that she cannot feel anything.
- Ⓒ She does not want others to know she is hurt.
- Ⓓ She does not know why she is smiling so much.

Reading Comprehension

- 5 How are paragraphs 34–36 **different** from the rest of the story?

(A) They teach a lesson.
(B) They solve a problem.
(C) They describe a memory.
(D) They introduce a character.

- 6 According to the story, what is Skate's favorite gift from GUM?

(A) the trips he takes with her
(B) the time he spends with her
(C) the special paper made in a factory
(D) the dress made from beautiful material

- 7 Based on the story, what does GUM do that makes him so interesting?

(A) sing
(B) shop
(C) camp
(D) travel

- 8 Who is the speaker in the story?

(A) Skate
(B) GUM
(C) a friend
(D) the mother

Reading Comprehension

- 9 Read paragraph 14 from the story in the box below.

He's fifty-seven years old . . . that's not old-old . . . not ancient old. He was twenty years old when my dad, his nephew, was born.

Which word in the paragraph helps readers understand the meaning of *ancient*?

- Ⓐ old
- Ⓑ twenty
- Ⓒ nephew
- Ⓓ born

- 10 Read paragraph 39 from the story in the box below.

"They're called *bindis*." He explains, "Indian women wear them on their foreheads."

Which of the following words from the paragraph is a **verb**?

- Ⓐ women
- Ⓑ wear
- Ⓒ them
- Ⓓ foreheads

Reading Comprehension

Question 11 is a short-response question. Write your answer to question 11 in the lined space below.

11 Based on the story, how does GUM show that he cares for Skate?

Question 12 is a short-response question. Write your answer to question 12 in the lined space below.

12 Based on the story, how does Skate show that she cares for GUM?

Reading Comprehension

In 1848, James Marshall made an important discovery. Read the selection to find out more about his discovery and answer the questions that follow.

GOLD FEVER!

by Peter and Connie Roop

1 **I**t was January 24, 1848. The sun rose over the California hills. James Marshall was up at dawn. He had to work on a new sawmill.

2 Looking into a hole in the ground by the sawmill, he saw a yellow rock. It was about the size and shape of a pea. Marshall picked up the shiny pebble and made history.

3 The rock was gold! James Marshall put the rock in his hat. He ran to show the other men working on the mill.

4 Captain John Sutter and James Marshall owned the sawmill where Marshall had been digging. Captain Sutter told Marshall to keep his discovery a secret. But, somehow, news of the gold spread quickly.

5 First tens, then hundreds, then thousands of people rushed to California. They all came to strike it rich finding gold!

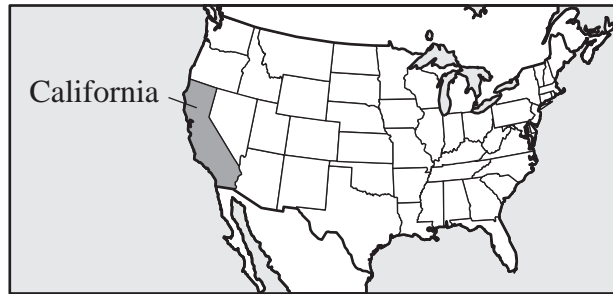


Sutter's Mill, California

6 For many years, California had been part of Mexico. By 1848, California was owned by the United States. But it was not a state. Only about 2,000 Americans lived in California at this time.

7 By 1849, things had changed. People from all around the world were excited about the gold. Farmers stopped digging in their fields. They went to California to dig for gold. Teachers quit teaching. Bakers stopped baking. Sailors jumped off their ships. Shopkeepers closed their stores. Families packed and left their homes.

Reading Comprehension



- 8 They all had gold fever!
- 9 The only cure for gold fever was to get to California. This rush of folks to find gold was the largest gold rush ever in the United States. The people who came in 1849 were called “forty-niners.” So many people came that California became the thirty-first state on September 9, 1850. James Marshall’s discovery of gold did indeed change history.

“Gold Fever!” by Peter and Connie Roop, from *California Gold Rush*. Text copyright © 2002 by Peter and Connie Roop. Reprinted by permission of Scholastic Inc. Photograph copyright © 2005 by California State Parks.

Reading Comprehension

Mark your choices for multiple-choice questions 13 through 17 by filling in the circle next to the best answer.

- 13 In paragraph 2, what is the **most likely** reason the rock is compared to a pea?

(A) to show that it was dirty
(B) to show that it was small
(C) to show that it was smooth
(D) to show that it was colorful

- 14 Read the sentence from paragraph 2 in the box below.

Marshall picked up the shiny pebble and made history.

Based on the selection, which of the following **best** describes how picking up the pebble “made history”?

(A) It taught the world how to find gold.
(B) It proved the importance of sawmills.
(C) It caused the building of new sawmills.
(D) It led to the beginning of the gold rush.

- 15 What is the **most likely** reason the map of the United States is included in the selection?

(A) to show where California is
(B) to show how old California is
(C) to show who lives in California
(D) to show how many people visit California

Reading Comprehension

- 16 Based on the selection, people were said to have “gold fever” when they

- Ⓐ paid for doctors using gold.
- Ⓑ found large amounts of gold.
- Ⓒ became ill while searching for gold.
- Ⓓ were able to think only about finding gold.

- 17 Based on paragraph 5, what does it mean to “strike it rich”?

- Ⓐ to quickly move to a new place
- Ⓑ to suddenly have a lot of money
- Ⓒ to need more money than you have
- Ⓓ to find something you are searching for

**Grade 3 English Language Arts
Reading Comprehension
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	10	<i>Reading and Literature</i>	12	D
2	10	<i>Reading and Literature</i>	8	D
3	10	<i>Reading and Literature</i>	12	D
4	10	<i>Reading and Literature</i>	15	A
5	11	<i>Reading and Literature</i>	12	C
6	11	<i>Reading and Literature</i>	12	B
7	11	<i>Reading and Literature</i>	12	D
8	11	<i>Reading and Literature</i>	12	A
9	12	<i>Language</i>	4	A
10	12	<i>Language</i>	5	B
11	13	<i>Reading and Literature</i>	12	
12	13	<i>Reading and Literature</i>	12	
13	16	<i>Reading and Literature</i>	15	B
14	16	<i>Reading and Literature</i>	13	D
15	16	<i>Reading and Literature</i>	13	A
16	17	<i>Reading and Literature</i>	13	D
17	17	<i>Language</i>	4	B

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for short-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

Grade 3 English Language Arts
Reading Comprehension
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
18	<i>Reading and Literature</i>	8
19	<i>Reading and Literature</i>	13
20	<i>Reading and Literature</i>	8
21	<i>Reading and Literature</i>	13
22	<i>Reading and Literature</i>	13
23	<i>Reading and Literature</i>	13
24	<i>Reading and Literature</i>	13
25	<i>Reading and Literature</i>	10
26	<i>Language</i>	4
27	<i>Language</i>	5
28	<i>Reading and Literature</i>	13
29	<i>Reading and Literature</i>	14
30	<i>Reading and Literature</i>	14
31	<i>Language</i>	5
32	<i>Reading and Literature</i>	10
33	<i>Language</i>	4
34	<i>Reading and Literature</i>	14
35	<i>Reading and Literature</i>	16
36	<i>Reading and Literature</i>	15
37	<i>Reading and Literature</i>	16
38	<i>Reading and Literature</i>	16
39	<i>Language</i>	5
40	<i>Language</i>	4
41	<i>Reading and Literature</i>	16

III. English Language Arts, Grade 4

A. Composition

B. Reading Comprehension

Grade 4 English Language Arts Test

Test Structure

The grade 4 English Language Arts test was presented in the following two parts:

- the ELA Composition test, which used a writing prompt to assess learning standards from the Massachusetts *English Language Arts Curriculum Framework*'s **Composition** strand
- the ELA Reading Comprehension test, which used multiple-choice and open-response questions (items) to assess learning standards from the *English Language Arts Curriculum Framework*'s **Language** and **Reading and Literature** strands

A. Composition

The spring 2012 grade 4 English Language Arts (ELA) Composition test and Composition Make-Up test were based on learning standards in the Composition strand of the Massachusetts *English Language Arts Curriculum Framework* (2001). The learning standards for the Composition strand appear on pages 72–83 of the *Framework*, which is available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Composition test results are reported under the reporting categories **Composition: Topic Development** and **Composition: Standard English Conventions**.

Test Sessions and Content Overview

The ELA Composition test included two separate test sessions, administered on the same day with a short break between sessions. During the first session, each student wrote an initial draft of a composition in response to the appropriate writing prompt on the next two pages. During the second session, each student revised his or her draft and submitted a final composition, which was scored in the areas of Topic Development and Standard English Conventions. The Scoring Guides for the MCAS English Language Arts Composition are available at www.doe.mass.edu/mcas/student/elacomp_scoreguide.html.

Reference Materials

At least one English-language dictionary per classroom was provided for student use during ELA Composition test sessions. The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only. No other reference materials were allowed during either ELA Composition test session.

Cross-Reference Information

Framework general standards 19–22 are assessed by the ELA Composition.

English Language Arts Test

Grade 4 Writing Prompt

WRITING PROMPT

Write about a time you did something exciting. Give enough details in your writing to show what you did and why it was exciting for you.

You may use the space below to plan what you are going to write (notes, outlines, other pre-writing activities).

English Language Arts Test

Grade 4 Make-Up Writing Prompt

WRITING PROMPT

Think about a time when you went to a special or an interesting place. Maybe it was the home of a friend or a relative, a place in your neighborhood, or someplace completely different.

Write a story about your special or interesting place and what happened to you while you were there. Give enough details to show the reader why this place was special or interesting to you.

You may use the space below to plan what you are going to write (notes, outlines, other pre-writing activities).

B. Reading Comprehension

The spring 2012 grade 4 English Language Arts Reading Comprehension test was based on learning standards in the two content strands of the Massachusetts *English Language Arts Curriculum Framework* (2001) listed below. Page numbers for the learning standards appear in parentheses.

■ Language (*Framework*, pages 19–26)

■ Reading and Literature (*Framework*, pages 35–64)

The *English Language Arts Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Reading Comprehension test results are reported under two MCAS reporting categories, **Language** and **Reading and Literature**, which are identical to the two framework content strands listed above.

Test Sessions and Content Overview

The grade 4 ELA Reading Comprehension test included two separate test sessions. Each session included reading passages, followed by multiple-choice and open-response questions. Selected common reading passages and approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both ELA Reading Comprehension test sessions. No other reference materials were allowed during any ELA Reading Comprehension test session.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework general standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

English Language Arts

READING COMPREHENSION

DIRECTIONS

This session contains two reading selections with fifteen multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

What happens when an elephant and a whale both think that they are the strongest animals on the earth? Read the folktale to find out and answer the questions that follow.

Strongest of All

LOUISIANA

by Pleasant DeSpain



- 1 One day long ago, clever Rabbit was walking along the seashore. Hearing voices, he stopped to listen. Elephant and Whale were having a conversation. He wanted to hear every word.
- 2 “Sister Whale,” said Elephant, “you are the largest, strongest, and most beautiful animal of the sea. Naturally, I’m the largest, strongest, and most beautiful animal on the land. We two should rule over all the animals, birds, and fish on the earth.”
- 3 “Yes, it’s true, Brother Elephant,” said Whale. “We are the greatest. You should rule the land. I’ll be happy to rule the sea.”
- 4 Rabbit decided to play a trick on these two behemoths.
- 5 “I’m twice as smart as both of them,” he said. “All I need is a long, strong rope and my jungle drum.”
- 6 Later that afternoon Rabbit found Elephant in the woods and said, “Hello, Powerful Ruler of All the Animals that Walk and All the Birds that Fly. I’m in need of a small favor.”
- 7 Elephant liked Rabbit’s compliment and was willing to listen.
- 8 “What can I do for you, my little friend?” he trumpeted.
- 9 “My milk-cow is stuck in the sand on the beach. I’m not big enough to pull her out. Let me tie one end of this rope around you and the other end around my cow. When you hear me beat my drum, you’ll know it’s time to pull hard, really hard.”

Reading Comprehension

10 “It’s a good plan,” said Elephant. “You are wise to come to me as I’m the strongest friend you have.”

11 “Thank you, Elephant. Wait for the drum!”

12 So saying, Rabbit ran to the beach and found Whale sunning herself near the shore.

13 “Hello, Friend Whale. My, but you look sleek and powerful today,” said Rabbit.

14 Whale smiled and replied, “Yes, Rabbit, I’m strong today and every day. I rule all the creatures of the sea.”

15 “Of course,” responded Rabbit. “That’s why I’ve come to you with my small problem.”

16 “What can I do to help?” asked Whale.

17 “It’s my milk-cow. She’s mired deep in the bayou-mud way up in the woods. I can’t get her out. I’d like to tie one end of this rope around your tail and the other end around my cow. I’ll beat my drum so you’ll know when to pull.”

18 “Of course I’ll help,” said Whale.

19 She swam closer to shore so that he could tie the long rope to her massive tail.

20 “Pull hard when you hear my signal,” said Rabbit as he ran back into the woods.

21 He found his drum and pounded hard and loud. *Boom! Boom! Boom!* The sounds carried to both Elephant in the forest and Whale in the sea.

22 They both began to pull, each against the other, and were shocked at the resistance. Elephant tugged so hard that Whale hit the sand in the shallow water. Whale pulled back so hard that Elephant was being dragged out of the woods.

23 “That cow must be stuck in the sand up to her neck,” bellowed Elephant.

24 “That cow must be buried in the mud up to her nose,” cried Whale.

25 Next thing they knew the rope snapped! One end flew back and stung Elephant on the ear.

26 “Ouch!” he cried.

27 The other end smacked Whale on the tail.

28 “Ouch!” she cried.

29 Rabbit began to laugh. His laughter carried deep into the woods and far out to sea. Elephant and Whale realized that they had been tricked. They also discovered that when it came to cleverness, Rabbit was the strongest of all.

Reading Comprehension

- 1 Which of the following **best** describes the setting of the folktale?
- A. by the ocean many years ago
 - B. at the zoo many years from now
 - C. in the mountains many years ago
 - D. near the desert many years from now
- 2 Based on the folktale, what is the **real** reason Rabbit asks Elephant and Whale for help?
- A. to teach them a lesson
 - B. to pull an animal to safety
 - C. to make his situation easier
 - D. to bring the animals closer together
- 3 What do paragraphs 23 and 24 **mostly** show about Elephant and Whale?
- A. They do not want to help each other.
 - B. They each think they are the smartest.
 - C. They need to stop pulling on the rope.
 - D. They do not realize they have been fooled.
- 4 Which of the following **best** shows that “Strongest of All” is a folktale?
- A. It tells a story using talking animals.
 - B. It includes a problem and a solution.
 - C. It tells a story using rhythm and rhyme.
 - D. It includes facts about different animals.
- 5 Reread paragraph 22. Based on the paragraph, the use of the word **resistance** shows the animals are
- A. playing a game.
 - B. afraid of being hurt.
 - C. having a difficult time.
 - D. worried about getting wet.

Reading Comprehension

Question 6 is an open-response question.

- Read the question carefully.
- Explain your answer.
- Add supporting details.
- Double-check your work.

Write your answer to question 6 in the space provided in your Student Answer Booklet.

- 6 Based on the folktale, explain the **most likely** reason the author states that “Rabbit was the strongest of all.” Support your answer with important details from the folktale.

Reading Comprehension

Donna O'Meara studies and photographs volcanoes. Read the selection to find out how she became interested in volcanoes and answer the questions that follow.

from *Into the Volcano*

BY DONNA O'MEARA

Some Like It Hot

1 **H**awaii's Kilauea volcano rumbles under my feet with thunder I feel in my stomach. The air reeks of burning metal. A towering dark steam cloud looms over me. Without warning, a football-sized chunk of gooey lava drops out of the cloud and plops onto the ground near me. I duck and run as more hissing red chunks splatter everywhere. These "lava bombs" could crush a skull as if it were an eggshell. What on Earth am I doing here, on the world's most active volcano?

2 **T**here were no volcanoes where I grew up. Our family lived in a quiet, little town in rural New England where the cows outnumbered the people. I was the eldest of three children and spent my childhood exploring the forests and fields.

3 My favorite pastime was sitting safe and dry on our porch watching violent summer thunderstorms rage through the Connecticut River Valley. Our springer spaniel, Dinney, would cower under my chair in fright, but the louder the thunder and brighter the lightning, the more thrilled I was.

4 In school I loved earth science and biology, but my guidance counselor suggested I take typing classes and become a secretary. That didn't interest me. Fortunately, I was artistic, so instead I majored in creative arts—painting, photography and writing. To this day I still can't type.

Reading Comprehension

- 5 In the 1970s I moved to Boston and worked for magazine and book publishers. But something was missing in my life. Although getting out into the countryside helped, I finally decided I had to make some changes. I wanted to learn about the earth and the sky and the stars, where they all came from and where they were going.
- 6 At age 32, I went back to college. My teacher, Stephen James O'Meara, opened my eyes to science when he described how our solar system was shaped by geological forces. One of the most dynamic forces, Steve said, was volcanism. I pictured Earth, with its 1500 or more volcanoes spewing lava, as it spun dizzily around our sun.
- 7 Steve studied volcanoes to learn how planets formed and to search for clues that might help predict when a volcano will erupt here on Earth. So far, no single scientific method can accurately predict deadly eruptions. Any new discoveries would be important scientifically and could save lives.
- 8 Steve's daring tales of exploring erupting volcanoes held me spellbound. When he passed around a piece of rough, hardened lava, I held it tight, closed my eyes and imagined myself climbing an erupting volcano in an exotic foreign country. Now that sounded like a good job for me!
- 9 Weeks after class ended, Steve and I had dinner. He described how he'd once jumped over a moving lava flow to save his life. I could barely believe what I was hearing. Asleep that night I dreamed of volcanoes.
- 10 On December 23, 1986, around noon, my office phone rang. It was Steve.
- 11 "Donna, have you ever seen an erupting volcano?"
- 12 No, of course I hadn't.
- 13 "I'm on my way to Kilauea and need a field assistant."
- 14 "Kilauea, Hawaii? When do we leave?"
- 15 I said "aloha" to my magazine boss and was on a plane to Hawaii before sunset that same night.

My First Volcano

- 16 **A**t noon on December 24, 1986, Steve and I strapped ourselves into a helicopter without doors and bounced on air drafts over a sizzling Hawaiian lava lake.
- 17 The lake had formed when a new vent, called Kupaianaha, had burst open on the east side of Kilauea volcano. A vent is an opening through which a volcano erupts lava and ash from inside the Earth.

Reading Comprehension

18 Lava oozed out of the vent, filling a huge depression to overflowing and creating a lava lake. The lava gushing into the lake from the vent caused sloshing waves.

19 As our pilot tilted the chopper to give us a better view, I clutched at the seat cushion for fear I would slide across the smooth leather and right out the open door. Below us a red lake the size of two football fields bubbled like a pot of oatmeal. Only this wasn't oatmeal. It was burning hot molten lava.

20 The chopper whirled down to the edge of the sizzling lake. Hot, glowing rock oozed from the earth like toothpaste out of a cracked tube. The helicopter cabin got hotter, and a burnt metal smell filled the air. Our pilot expertly dodged chunks of spatter the volcano flung at us. We landed on the ground with a soft thump.

21 Steve and the pilot jumped out and ducked the rotors, leaving the engine running for a fast getaway. I thought about the gasoline in the engine near this heat.



Helicopters take volcano hunters where the action is. This one approaches a smoking crater. It's similar to the one we took to see the lava lake — only our chopper didn't have doors!



Fresh lava smells like burning metal. Here, it wipes out a road. I didn't know then that molten lava can be 1150°C (2100°F) when it erupts out of the earth.



Reading Comprehension

22 I watched as Steve walked right up to the creeping lava flow—and survived. The scientist in me said “Hey, isn’t this what you went back to school for?” The artist in me had to admit the lake was strangely beautiful. Glowing pinkish-orange lava was creeping along, hissing and popping as if it were alive. This was the opportunity I had been waiting for my whole life. I grabbed my camera and jumped out of the chopper. I felt heat through the soles of my sneakers. I changed lenses and started shooting.

Explosive Facts

Name of volcano: Kilauea

Location: Hawaii, U.S.A.

Status: active

Type: shield volcano

Height: 1222 m (4009 ft.)

Known people killed: about 120

Into the Volcano by Donna O’Meara. Text copyright © 2005 by Donna O’Meara. Photographs copyright © by Stephen James O’Meara and Donna O’Meara. Reprinted by permission of Kids Can Press Ltd.

- 7 What is the **main** purpose of paragraph 1 in the selection?
- A. to grab the reader’s interest
 - B. to explain the main problem
 - C. to introduce the main character
 - D. to answer the reader’s questions

- 8 Based on paragraph 5, which of the following is **most likely** true about the author?
- A. She is scared of things that are new to her.
 - B. She is upset about things she cannot control.
 - C. She is satisfied with things that remain the same.
 - D. She is curious about things she does not understand.

Reading Comprehension

- 9 Based on the selection, what **first** made the author interested in volcanoes?
- A. She saw a volcano erupting.
 - B. She studied volcanoes in college.
 - C. She wrote a book about volcanoes.
 - D. She heard about a volcano as a child.

- 10 According to paragraph 19, why did the helicopter turn?
- A. to visit a different volcano
 - B. to find another landing spot
 - C. to help the passengers see better
 - D. to keep the passengers in their seats

- 11 Read the sentence from paragraph 20 in the box below.

Hot, glowing rock oozed from the earth like toothpaste out of a cracked tube.

In the sentence, the lava is compared to toothpaste to show

- A. how hot the lava feels to the touch.
- B. how clean the lava looks on the ground.
- C. how sticky the lava looks against the rocks.
- D. how slowly the lava flows from the ground.

Reading Comprehension

12 Which of the following events from the selection happened **last**?

- A. The author rode in a helicopter.
- B. The author studied painting in school.
- C. The author photographed the volcano.
- D. The author worked for a book publisher.

13 What is the **main** purpose of the “Explosive Facts” box?

- A. to explain the dangers of Kilauea
- B. to describe the appearance of Kilauea
- C. to give more information about Kilauea
- D. to list other volcanoes found around Kilauea

14 Which of the following **best** shows that the selection is from an autobiography?

- A. The author teaches facts about volcanoes.
- B. The author describes events from her own life.
- C. The author persuades readers to protect nature.
- D. The author makes up a story about a famous scientist.

Reading Comprehension

- 15 Read the sentence from paragraph 6 in the box below.

I pictured Earth, with its 1500 or more volcanoes spewing lava, as it spun dizzily around our sun.

Which of the following words from the sentence is a verb?

- A. volcanoes
- B. lava
- C. spun
- D. around

- 16 Read the sentence from paragraph 7 in the box below.

Steve studied volcanoes to learn how planets formed and to search for clues that might help predict when a volcano will erupt here on Earth.

Based on the sentence, what does *predict* mean?

- A. to describe changes
- B. to hear something clearly
- C. to find something that was lost
- D. to tell what will happen in the future

Reading Comprehension

Question 17 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 17 in the space provided in your Student Answer Booklet.

- 17** Based on the selection, describe what the author's first experience with a volcano was like. Support your answer with important information from the selection.

**Grade 4 English Language Arts
Reading Comprehension
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	27	<i>Reading and Literature</i>	16	A
2	27	<i>Reading and Literature</i>	16	A
3	27	<i>Reading and Literature</i>	16	D
4	27	<i>Reading and Literature</i>	10	A
5	27	<i>Language</i>	4	C
6	28	<i>Reading and Literature</i>	16	
7	32	<i>Reading and Literature</i>	13	A
8	32	<i>Reading and Literature</i>	13	D
9	33	<i>Reading and Literature</i>	13	B
10	33	<i>Reading and Literature</i>	8	C
11	33	<i>Reading and Literature</i>	15	D
12	34	<i>Reading and Literature</i>	8	C
13	34	<i>Reading and Literature</i>	13	C
14	34	<i>Reading and Literature</i>	10	B
15	35	<i>Language</i>	5	C
16	35	<i>Language</i>	4	D
17	36	<i>Reading and Literature</i>	13	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for the open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

Grade 4 English Language Arts
Reading Comprehension
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
18	<i>Reading and Literature</i>	13
19	<i>Reading and Literature</i>	13
20	<i>Reading and Literature</i>	13
21	<i>Reading and Literature</i>	8
22	<i>Reading and Literature</i>	13
23	<i>Reading and Literature</i>	13
24	<i>Reading and Literature</i>	13
25	<i>Reading and Literature</i>	12
26	<i>Reading and Literature</i>	12
27	<i>Reading and Literature</i>	12
28	<i>Reading and Literature</i>	12
29	<i>Reading and Literature</i>	12
30	<i>Reading and Literature</i>	12
31	<i>Reading and Literature</i>	12
32	<i>Reading and Literature</i>	12
33	<i>Language</i>	4
34	<i>Language</i>	5
35	<i>Reading and Literature</i>	12
36	<i>Reading and Literature</i>	15
37	<i>Reading and Literature</i>	14
38	<i>Reading and Literature</i>	15
39	<i>Language</i>	5
40	<i>Language</i>	4

IV. English Language Arts, Reading Comprehension, Grade 5

Grade 5 English Language Arts

Reading Comprehension Test

The spring 2012 grade 5 English Language Arts Reading Comprehension test was based on learning standards in the two content strands of the Massachusetts *English Language Arts Curriculum Framework* (2001) listed below. Specific learning standards for grade 5 are found in the *Supplement to the Massachusetts English Language Arts Curriculum Framework* (2004). Page numbers for the learning standards appear in parentheses.

■ Language (*Framework*, pages 19–26; *Supplement*, page 10)

■ Reading and Literature (*Framework*, pages 35–64; *Supplement*, pages 11–13)

The *English Language Arts Curriculum Framework* and *Supplement* are available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Reading Comprehension test results are reported under two MCAS reporting categories, **Language** and **Reading and Literature**, which are identical to the two framework content strands listed above.

Test Sessions and Content Overview

The grade 5 ELA Reading Comprehension test included two separate test sessions. Each session included reading passages, followed by multiple-choice and open-response questions. Selected common reading passages and approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both ELA Reading Comprehension sessions. No other reference materials were allowed during any ELA Reading Comprehension test session.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework general standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

English Language Arts

READING COMPREHENSION

DIRECTIONS

This session contains two reading selections with sixteen multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

Read the selection to find out why some plants smell bad. Then answer the questions that follow.

Foul Flora

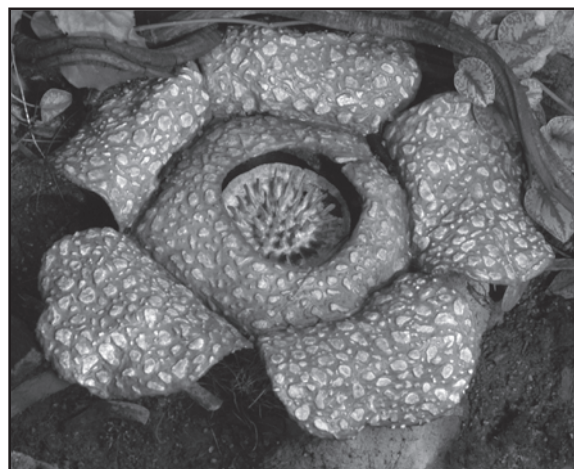
by Marilyn Singer

The Rancid Rafflesia

1 What weighs as much as a miniature poodle and smells as bad as rotten dog food? Would you believe it's a *flower*? The rafflesia is the world's largest flower. When it's in full bloom, it can weigh up to fifteen pounds and be a yard wide. Found on rain forest floors in Indonesia, Borneo, and Sumatra, it is a parasite that lives off the roots of a vine related to the grapevine. Having no roots, stems, leaves, or chlorophyll, the rafflesia gets its food from that plant.

2 The rafflesia takes nine months to reach full size. Then it bursts out like a big, orange cabbage and expands into a blossom as much as three feet wide and up to fifteen pounds in weight. Flowering for just four to six days, it fills the air with a stench like carrion,* which has earned it the name "stinking corpse lily."

3 Why would any flower smell like that? The answer has to do with *pollination*.



rafflesia blossom

Two, Four, Six, Eight— Now's the Time to Pollinate!

4 In order to reproduce, most flowers need to be pollinated. For flowers to make fruit and seeds, pollen from the male parts needs to reach the female parts. Some plants can pollinate themselves. Others must be pollinated by wind, water, or animals.

5 If a flower smells yummy during the day, chances are that it is pollinated by butterflies, bees, wasps, certain beetles, or other insects that are attracted to sweet odors. Pollen clings to them and is deposited on other blossoms. Pale or white flowers that are fragrant at night usually attract moths. Dull-colored, odorless plants are often wind-pollinated. Some bright, odorless blooms may be pollinated by birds, such as hummingbirds, which have a poor sense of smell. The birds

* *carrion* — decaying flesh

Reading Comprehension

go to drink nectar, and the pollen sticks to their feathers or beaks. Colorful but unscented flowers also appeal to bees, wasps, and butterflies, which look for blossoms of particular colors and shapes and not just scent. And if a flower smells—and sometimes even looks—bad, it lures flies, carrion beetles, or other critters that love the putrid odor of rotten meat or fish.

Going Batty!

6 Flies and beetles aren't the only creatures attracted to smelly flowers. Many plants are pollinated by bats. What odors do bats prefer? Some like the smell of rotting fruit. And some like the musty aroma of fellow bats.

7 In Africa, the baobab tree (*Adansonia digitata*) produces gorgeous blossoms that reek rather like these flying mammals. Because bats are nocturnal, the flowers open at night and are pale in color so the bats can see (and smell) them more easily. While they are eating the flowers' nectar, the pollen sticks to the bats' fur or mouths. As they fly from bloom to bloom, they transfer it.

8 The baobab is a magnificent and important plant. Animals live in its branches. People use all of it—the bark for cloth and rope, the leaves for medicine, the fruit for food—and sometimes even take shelter inside its huge trunk.

9 Another important relative of the baobab is the silk cotton tree (*Ceiba pentandra*). This tree's fruits produce *kapok*—a fluffy material once widely used in lifejackets, sleeping bags, quilts, mattresses, and pillows because it is buoyant and warm. In many places the wood is still used to make canoes. Like the baobab, the kapok has malodorous flowers that attract bats. In some places, bats appear to be the plant's *only* pollinator and seed disperser. Eliminate the bats, and you eliminate the tree—one of many good reasons to protect these mammals.

10 Baobab and kapok blossoms, like carrion flowers, certainly smell great to their animal pollinators, but there's a good chance Mom won't like them. So when it comes to Mother's Day, it's best to stick with roses.



field of baobab trees



kapok blossom

"Foul Flora" by Marilyn Singer, from *What Stinks?* Copyright © 2006 by Marilyn Singer. Reprinted by permission of Darby Creek, a division of Lerner Publishing Group, Inc. Photograph 1 copyright © iStockphoto/wrangel. Photograph 2 copyright © iStockphoto/jeu. Photograph 3 copyright © iStockphoto/Angela Bell.

Reading Comprehension

- 1 Based on the selection, where does the rafflesia get its food?
 - A. from carrion beetles
 - B. from another plant
 - C. from bats
 - D. from soil
- 2 Based on paragraph 5, how does a plant attract insects at night?
 - A. by its appearance and odor
 - B. by its appearance and size
 - C. by its location and odor
 - D. by its location and size
- 3 What is the **best** conclusion that can be drawn from the information in paragraph 5?
 - A. Plants do not rely on pollination to reproduce.
 - B. Plants have many ways to appeal to pollinators.
 - C. Plants must be pollinated by more than one animal.
 - D. Plants do not make pollen at certain times of the year.

Reading Comprehension

4 According to the selection, what would **most likely** happen if bats were to disappear from Earth?

- A. Flowers would become more fragrant.
- B. Baobab trees would become more common.
- C. Silk cotton trees would no longer reproduce.
- D. Colorless flowers would no longer be necessary.

5 According to paragraph 8, why is the baobab tree important?

- A. It serves many different purposes.
- B. It is one of the oldest trees in the world.
- C. It is one of the largest trees in the world.
- D. It stores water in periods of dry weather.

6 Read the sentence from paragraph 9 in the box below.

Like the baobab, the kapok has malodorous flowers that attract bats.

The prefix *mal-* means “bad.” What does the word **malodorous** mean?

- A. stinky
- B. strange
- C. prickly
- D. poisonous

Reading Comprehension

Question 7 is an open-response question.

- Read the question carefully.
- Explain your answer.
- Add supporting details.
- Double-check your work.

Write your answer to question 7 in the space provided in your Student Answer Booklet.

- 7 Explain how the author makes the selection both entertaining and informative. Support your answer with important details from the selection.

Reading Comprehension

In the imaginary land of Narnia, two animals—an ape named Shift and a donkey named Puzzle—are friends. Read the selection about one of their adventures and answer the questions that follow.

BY CALDRON POOL

by C. S. Lewis

- 1 **I**n the last days of Narnia, far up to the west beyond Lantern Waste and close beside the great waterfall, there lived an Ape. He was so old that no one could remember when he had first come to live in those parts, and he was the cleverest, ugliest, most wrinkled Ape you can imagine. He had a little house, built of wood and thatched with leaves, up in the fork of a great tree, and his name was Shift. There were very few Talking Beasts or Men or Dwarfs, or people of any sort, in that part of the wood, but Shift had one friend and neighbor who was a donkey called Puzzle. At least they both said they were friends, but from the way things went on you might have thought Puzzle was more like Shift's servant than his friend. He did all the work. When they went together to the river, Shift filled the big skin bottles with water but it was Puzzle who carried them back. When they wanted anything from the towns further down the river it was Puzzle who went down with empty panniers* on his back and came back with the panniers full and heavy. And all the nicest things that Puzzle brought back were eaten by Shift; for as Shift said, "You see, Puzzle, I can't eat grass and thistles like you, so it's only fair I should make it up in other ways." And Puzzle always said, "Of course, Shift, of course. I see that." Puzzle never complained, because he knew that Shift was far cleverer than himself and he thought it was very kind of Shift to be friends with him at all. And if ever Puzzle did try to argue about anything, Shift would always say, "Now, Puzzle, I understand what needs to be done better than you. You know you're not clever, Puzzle." And Puzzle always said, "No, Shift. It's quite true. I'm *not* clever." Then he would sigh and do whatever Shift had said.
- 2 One morning early in the year the pair of them were out walking along the shore of Caldron Pool. Caldron Pool is the big pool right under the cliffs at the western end of Narnia. The great waterfall pours down into it with a noise like everlasting thunder, and the River of Narnia flows out on the other side. The waterfall keeps the Pool always dancing and bubbling and churning round and round as if it were on the boil, and that of course is how it got its name of Caldron Pool. It is liveliest in the early spring when the waterfall is swollen with all the snow that has melted off the mountains from up beyond Narnia in the Western Wild from which the river comes. And as they looked at Caldron Pool Shift suddenly pointed with his dark, skinny finger and said,
- 3 "Look! What's that?"
- 4 "What's what?" said Puzzle.

* *panniers* — baskets

Reading Comprehension

- 5 “That yellow thing that’s just come down the waterfall. Look! There it is again, it’s floating. We must find out what it is.”
- 6 “Must we?” said Puzzle.
- 7 “Of course we must,” said Shift. “It may be something useful. Just hop into the Pool like a good fellow and fish it out. Then we can have a proper look at it.”
- 8 “Hop into the Pool?” said Puzzle, twitching his long ears.
- 9 “Well how are we to get it if you don’t?” said the Ape.
- 10 “But—but,” said Puzzle, “wouldn’t it be better if *you* went in? Because, you see, it’s you who wants to know what it is, and I don’t much. And you’ve got hands, you see. You’re as good as a Man or a Dwarf when it comes to catching hold of things. I’ve only got hoofs.”
- 11 “Really, Puzzle,” said Shift, “I didn’t think you’d ever say a thing like that. I didn’t think it of you, really.”
- 12 “Why, what have I said wrong?” said the Ass, speaking in rather a humble voice, for he saw that Shift was very deeply offended. “All I meant was—”
- 13 “Wanting *me* to go into the water,” said the Ape. “As if you didn’t know perfectly well what weak chests Apes always have and how easily they catch cold! Very well. I *will* go in. I’m feeling cold enough already in this cruel wind. But I’ll go in. I shall probably die. Then you’ll be sorry.” And Shift’s voice sounded as if he was just going to burst into tears.
- 14 “Please don’t, please don’t, please don’t,” said Puzzle, half braying, and half talking. “I never meant anything of the sort, Shift, really I didn’t. You know how stupid I am and how I can’t think of more than one thing at a time. I’d forgotten about your weak chest. Of course I’ll go in. You mustn’t think of doing it yourself. Promise me you won’t, Shift.”
- 15 So Shift promised, and Puzzle went cloppety-clop on his four hoofs round the rocky edge of the Pool to find a place where he could get in. Quite apart from the cold it was no joke getting into that quivering and foaming water, and Puzzle had to stand and shiver for a whole minute before he made up his mind to do it. But then Shift called out from behind him and said: “Perhaps I’d better do it after all, Puzzle.” And when Puzzle heard that he said, “No, no. You promised. I’m in now,” and in he went.
- 16 A great mass of foam got him in the face and filled his mouth with water and blinded him. Then he went under altogether for a few seconds, and when he came up again he was in quite another part of the Pool. Then the swirl caught him and carried him round and round and faster and faster till it took him right under the waterfall itself, and the force of the water plunged him down, deep down, so that he thought he would never be able to hold his breath till he came up again. And when he had come up and when at last he got somewhere near the thing he was trying to catch, it sailed away from him till it too got under the fall and was forced down to the bottom. When it came up again it was further from him than ever. But at last, when he was almost tired to death, and bruised all over and numb with cold, he succeeded in gripping the thing with his teeth. And out he came carrying it in

Reading Comprehension

front of him and getting his front hoofs tangled up in it, for it was as big as a large hearthrug, and it was very heavy and cold and slimy.

17 He flung it down in front of Shift and stood dripping and shivering and trying to get his breath back. But the Ape never looked at him or asked him how he felt. The Ape was too busy going round and round the Thing and spreading it out and patting it and smelling it. Then a wicked gleam came into his eye and he said:

18 “It is a lion’s skin.”

19 “Ee—auh—auh—oh, is it?” gasped Puzzle.

20 “Now I wonder . . . I wonder . . . I wonder,” said Shift to himself, for he was thinking very hard.

21 “I wonder who killed the poor lion,” said Puzzle presently. “It ought to be buried. We must have a funeral.”

22 “Oh, it wasn’t a Talking Lion,” said Shift. “You needn’t bother about *that*. There are no Talking Beasts up beyond the Falls, up in the Western Wild. This skin must have belonged to a dumb, wild lion.”

23 This, by the way, was true. A Hunter, a Man, had killed and skinned this lion somewhere up in the Western Wild several months before. But that doesn’t come into this story.

“By Caldron Pool” by C.S. Lewis, from *The Last Battle*. Copyright © 1956 by C.S. Lewis Pte. Ltd. Reprinted by permission of The C.S. Lewis Company Ltd.

Reading Comprehension

- 8 In the selection, how does Shift **mostly** control Puzzle's behavior?
- A. by telling Puzzle that he will be rewarded for obeying
 - B. by reminding Puzzle that he is unintelligent
 - C. by urging Puzzle to be more daring
 - D. by warning Puzzle about danger
- 9 Based on paragraph 2, which of the following **best** explains how the Pool got its name?
- A. It is filled with unknown objects.
 - B. It is deeper than other bodies of water.
 - C. It is black and dirty like a kettle used for cooking.
 - D. It is swirling and foaming like soup being stirred in a pot.
- 10 According to the selection, why does Puzzle think it would be best for Shift to go into the water?
- A. Shift loves to go swimming.
 - B. Puzzle feels he is becoming ill.
 - C. Shift grabs things more easily than Puzzle.
 - D. Puzzle knows Shift enjoys finding treasure.
- 11 Which of the following **best** describes what happens in paragraph 14?
- A. Puzzle gives in to Shift's demands.
 - B. Shift expresses concern for Puzzle's health.
 - C. Shift offers to go into the Pool instead of Puzzle.
 - D. Puzzle explains why Shift should go into the Pool.

Reading Comprehension

- 12 Which of the following statements **best** describes what happens in paragraph 15?
- A. Shift asks Puzzle to forget about the object in the Pool.
 - B. Shift decides that he should let Puzzle go into the Pool.
 - C. Shift apologizes to Puzzle for forcing him to go into the Pool.
 - D. Shift watches while Puzzle gathers his courage to enter the Pool.

- 13 Read the description from paragraph 16 in the box below.

Then the swirl caught him and carried him round and round and faster and faster . . . and the force of the water plunged him down, deep down, . . .

What is the **main** effect of repeating the words “round,” “faster,” and “down” in the description?

- A. It suggests that Puzzle is dreaming.
- B. It suggests the power of the current.
- C. It shows how strongly Puzzle swims.
- D. It shows the weight of the yellow object.

- 14 Who is telling the story?
- A. Shift
 - B. a lion
 - C. Puzzle
 - D. a narrator

- 15 Which of the following is the **best** clue that the selection is a fantasy?
- A. The characters find a hidden object.
 - B. The characters are animals that talk.
 - C. The characters experience a conflict.
 - D. The characters perform a brave deed.

Reading Comprehension

- 16** Read the sentence from paragraph 7 in the box below.

“Just hop into the Pool like a good fellow and fish it out.”

Which of the following words in the sentence is used as a verb?

- A. Just
- B. Pool
- C. good
- D. fish

- 17** In paragraph 12, what does the word *offended* mean?

- A. hurt
- B. modest
- C. pleased
- D. surprised

Question 18 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 18 in the space provided in your Student Answer Booklet.

- 18** Based on the selection, describe the differences between Shift’s and Puzzle’s personalities. Support your answer with important details from the selection.

**Grade 5 English Language Arts
Reading Comprehension
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	43	<i>Reading and Literature</i>	8	B
2	43	<i>Reading and Literature</i>	13	A
3	43	<i>Reading and Literature</i>	13	B
4	44	<i>Reading and Literature</i>	13	C
5	44	<i>Reading and Literature</i>	8	A
6	44	<i>Language</i>	4	A
7	45	<i>Reading and Literature</i>	13	
8	49	<i>Reading and Literature</i>	12	B
9	49	<i>Reading and Literature</i>	15	D
10	49	<i>Reading and Literature</i>	8	C
11	49	<i>Reading and Literature</i>	12	A
12	50	<i>Reading and Literature</i>	12	D
13	50	<i>Reading and Literature</i>	15	B
14	50	<i>Reading and Literature</i>	12	D
15	50	<i>Reading and Literature</i>	10	B
16	51	<i>Language</i>	5	D
17	51	<i>Language</i>	4	A
18	51	<i>Reading and Literature</i>	12	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for the open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

Grade 5 English Language Arts
Reading Comprehension
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
19	<i>Reading and Literature</i>	12
20	<i>Reading and Literature</i>	8
21	<i>Reading and Literature</i>	12
22	<i>Reading and Literature</i>	12
23	<i>Reading and Literature</i>	12
24	<i>Reading and Literature</i>	12
25	<i>Reading and Literature</i>	13
26	<i>Reading and Literature</i>	13
27	<i>Reading and Literature</i>	13
28	<i>Reading and Literature</i>	13
29	<i>Reading and Literature</i>	13
30	<i>Reading and Literature</i>	8
31	<i>Reading and Literature</i>	13
32	<i>Reading and Literature</i>	13
33	<i>Language</i>	4
34	<i>Language</i>	4
35	<i>Reading and Literature</i>	13
36	<i>Reading and Literature</i>	15
37	<i>Reading and Literature</i>	14
38	<i>Reading and Literature</i>	14
39	<i>Reading and Literature</i>	14
40	<i>Language</i>	4

V. English Language Arts,
Reading Comprehension, Grade 6

Grade 6 English Language Arts

Reading Comprehension Test

The spring 2012 grade 6 English Language Arts Reading Comprehension test was based on learning standards in the two content strands of the Massachusetts *English Language Arts Curriculum Framework* (2001) listed below. Page numbers for the learning standards appear in parentheses.

■ Language (*Framework*, pages 19–26)

■ Reading and Literature (*Framework*, pages 35–64)

The *English Language Arts Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Reading Comprehension test results are reported under two MCAS reporting categories, **Language** and **Reading and Literature**, which are identical to the two framework content strands listed above.

Test Sessions and Content Overview

The grade 6 ELA Reading Comprehension test included two separate test sessions. Each session included reading passages, followed by multiple-choice and open-response questions. Selected common reading passages and approximately half of the common test items are shown on the following pages as they appeared in test booklets. Due to copyright restrictions, certain reading passages cannot be released to the public on the website. For further information, contact Student Assessment Services at 781-338-3625.

Reference Materials

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both ELA Reading Comprehension sessions. No other reference materials were allowed during any ELA Reading Comprehension test session.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework general standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

English Language Arts

READING COMPREHENSION

DIRECTIONS

This session contains two reading selections with sixteen multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

It may be important to think about more than just getting a drink when you pick up a bottle of water. This article discusses some of the problems that bottled water causes. Read the article and answer the questions that follow.

All Bottled Up

by Jodie Mangor

1 **V**oss and Imsdal come from Norway, Bisleri is bottled in India, and Vata is an Iranian brand. Around the globe, people are quenching their thirst with bottled water. In the past 10 years, sales in Asia and South America have tripled. In 2007, people in the United States drank more than 8 billion gallons of bottled water. The United States currently consumes the most bottled water in the world, followed by Mexico, China, and Brazil. Compared to sugary, caffeinated soft drinks, this seems a healthy choice. But is it a wise one?

Water for One

- 2 A single-serve water bottle offers great convenience. It can be bought almost anywhere, carried around for a while, and then thrown away.
- 3 The impact of bottled water on the environment, however, is staggering. Approximately 2.7 million tons of plastic are turned into disposable bottles each year. This requires large quantities of crude oil and water. It also produces greenhouse gases. Bottled water is often shipped long distances to reach consumers, sometimes transcontinentally.



This uses even more fossil fuels and creates more pollution.

- 4 Although the bottles can be recycled, only a fraction of them are. The United States only recycles about 23 percent. The rest are part of a growing solid waste problem.

Bottled Over Tap?

- 5 Convenience isn't the only reason for bottled water's rise in popularity. Words like "pristine" and "pure," together with images of mountains or glaciers, are used to market bottled water. Many people believe that it must be cleaner

Reading Comprehension

and more healthful than tap water¹ from public water systems. But this is a misconception. In developed nations such as the United States and in Europe, regulations that ensure safe water are often stricter for tap than for bottled water. In the United States, tap water is regulated by the Environmental Protection Agency (EPA). Bottled water, which is viewed as a packaged food product, is regulated by individual states if it stays within their borders or by the Food and Drug Administration (FDA) if it crosses state lines.

- 6 Jermuk water, which is bottled in Armenia, provides an example of how bottled water standards vary from place to place. In 2007, Jermuk water was pulled from American shelves by the FDA because it contained arsenic² levels as high as 674 micrograms per liter. Armenian standards allow as much as 700 micrograms of arsenic per liter of water, but U.S. standards set the limit at 10 micrograms per liter.
- 7 It may come as a surprise that as much as 40 percent of the water bottled in the United States starts out as tap water. Before bottling, some companies filter it, and they might add minerals for taste.
- 8 Despite its sometimes humble origins, bottled water can cost anywhere from 240 to 10,000 times more per gallon than tap water.

Is the Bottle Ever Better?

- 9 At times, bottled water is the best available option. Hurricanes, other natural disasters, and emergency situations such

as the terrorist attacks on the Pentagon and World Trade Center in 2001 can negatively affect the safety of public water. Reliable water systems may not be in place in developing nations and war-torn countries. In these cases, bottled water can provide an important source of clean, safe, drinking water.

Future Solutions

- 10 “Back to the tap” movements are cropping up around the world. In order to save money, use fewer resources, and create less waste, they advocate using tap water and reusable “sports” bottles rather than bottled water. San Francisco and other cities across the United States no longer allow their governmental departments to buy single-serve water bottles. Cities in Canada, Australia, and the United Kingdom are considering similar bans.
- 11 Many bottled water companies are trying to do their part, too. They have reduced the amount of plastic in their bottles and bottle caps. Both the Colorado-based BIOTA company and the English company Belu Water use biodegradable plastic bottles derived from corn. Belu takes it a step further by donating some of its profits to clean water projects.
- 12 Bottled water has become an international phenomenon.³ While it is an important source of safe drinking water, we should not lose sight of a more environmentally friendly source: the water that comes out of our taps.

¹ *tap water* — water drawn from a faucet

² *arsenic* — a poisonous chemical

³ *phenomenon* — any observable fact or event; fad

Reading Comprehension

- 1 What is the **main** purpose of the statistics in paragraph 1?
- A. to explain which countries lead in bottled water use
 - B. to list the international names of bottled water products
 - C. to show readers that bottled water is popular everywhere
 - D. to convince readers that bottled water is better than sugary drinks
- 2 According to the article, what is the **main** problem with bottled water?
- A. the waste associated with the bottles
 - B. the difficulty of transporting the bottles
 - C. the amount of water required to fill the bottles
 - D. the inconsistent quality of the water in the bottles
- 3 Based on paragraph 5, why are words such as “pristine” and “pure” used to sell bottled water?
- A. to meet governments’ laws
 - B. to influence people’s choices
 - C. to present scientific evidence
 - D. to show the values of a company

Reading Comprehension

- 4 Which of the following conclusions is supported by the information in paragraphs 7 and 8?
- A. Bottled water has been proven to be of much higher quality than tap water.
 - B. People may be buying water they could get less expensively at home.
 - C. People have come to prefer the added flavors of bottled water.
 - D. Tap water needs to be purified before it is safe to drink.

- 5 Read the sentence from paragraph 3 in the box below.

Bottled water is often shipped long distances to reach consumers, sometimes transcontinentally.

In the word *transcontinentally*, the prefix *trans-* means

- A. nearly.
- B. across.
- C. toward.
- D. beneath.

- 6 Read the sentence from paragraph 10 in the box below.

In order to save money, use fewer resources, and create less waste, they advocate using tap water and reusable “sports” bottles rather than bottled water.

In the sentence, what does the word *advocate* **most likely** mean?

- A. debate
- B. predict
- C. research
- D. encourage

Reading Comprehension

Question 7 is an open-response question.

- Read the question carefully.
- Explain your answer.
- Add supporting details.
- Double-check your work.

Write your answer to question 7 in the space provided in your Student Answer Booklet.

- 7 Based on the article, explain the positive **and** negative effects of the use of bottled water. Support your answer with important details from the article.

Reading Comprehension

In the fantasy Abel's Island, the mouse Abelard (Abel) is stranded by a flood on an island. Even though he misses his wife, Amanda, he comes to find that the island can be a pretty and interesting place. Read the selection from Abel's Island and answer the questions that follow.

from **Abel's Island**
by William Steig

Students read a selection from *Abel's Island* and then answered questions 8 through 18 that follow on pages 64 to 66 of this document.

Due to copyright restrictions, the selection cannot be released to the public over the Internet. For more information, see the copyright citation below.

Abel's Island by William Steig. Copyright © 1976 by William Steig. Reprinted by permission of Farrar, Straus and Giroux, LLC.

Reading Comprehension

Due to copyright restrictions, the selection that appeared on this page cannot be released to the public over the Internet. For more information, see the citation on the previous page.

Due to copyright restrictions, the selection that appeared on this page cannot be released to the public over the Internet. For more information, see the citation on page 61.

Reading Comprehension

- 8 What happens in paragraph 2?
- A. Abel decides to try to escape from the island.
 - B. Abel feels threatened by the changing weather.
 - C. Abel becomes more aware of his surroundings.
 - D. Abel discovers that other creatures are on the island.
- 9 Based on the selection, what is the **main** reason Abel places the statues outside his windows?
- A. to help protect him
 - B. to decorate his yard
 - C. to show off his talent
 - D. to keep him company

- 10 According to the selection, how does Abel keep track of time?
- A. by using the watch he finds
 - B. by marking off days on a tree
 - C. by observing changes in nature
 - D. by recording the movement of the stars
- 11 Read the sentence from paragraph 9 in the box below.

The book was four tails long, three wide, and almost a tail thick.

What does the sentence explain?

- A. how Abel measures things
- B. why the book interests Abel
- C. how tiny the book seems to Abel
- D. why Abel thinks another mouse is nearby

Reading Comprehension

- 12 Based on the selection, what is the **main** reason the book is important to Abel?
- A. It is one of his favorite stories.
 - B. He knows the person who left it.
 - C. It gives him hope of being rescued.
 - D. He can use it as a piece of furniture.

- 13 What does paragraph 15 suggest?
- A. Abel is excited by the story.
 - B. Abel gets cold while reading.
 - C. Abel is confused by the story.
 - D. Abel gets hungry while reading.

- 14 Read the description from paragraph 18 in the box below.

... the roaring and gurgling of the river, the wailing and whining of the wind, the pattering and dripping of rain, the chirruping of birds and the chirring of insects, ...

What is the **main** effect of the description?

- A. to show a break in the sounds
 - B. to suggest the softness of the sounds
 - C. to contrast the silence with the sounds
 - D. to create a sensory image of the sounds
- 15 Based on the selection, what **most** helps Abel survive on the island?
- A. He is practical and creative.
 - B. He has lived by himself before.
 - C. He likes to live and work outdoors.
 - D. He saved many possessions from the flood.

Reading Comprehension

16 In paragraph 18, why does Abel **most** appreciate the ticking of the watch?

- A. The ticking helps him sleep better.
- B. The ticking reminds him of music.
- C. The ticking makes him feel less alone.
- D. The ticking drowns out noises that frighten him.

17 Based on paragraph 3, what does the word *wrought* mean?

- A. discovered
- B. imagined
- C. produced
- D. learned

Question 18 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 18 in the space provided in your Student Answer Booklet.

18 Based on the selection, describe how Abel shows that he is a civilized mouse. Support your answer with important details from the selection.

**Grade 6 English Language Arts
Reading Comprehension
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	58	<i>Reading and Literature</i>	13	C
2	58	<i>Reading and Literature</i>	8	A
3	58	<i>Reading and Literature</i>	15	B
4	59	<i>Reading and Literature</i>	13	B
5	59	<i>Language</i>	4	B
6	59	<i>Language</i>	4	D
7	60	<i>Reading and Literature</i>	13	
8	64	<i>Reading and Literature</i>	8	C
9	64	<i>Reading and Literature</i>	12	D
10	64	<i>Reading and Literature</i>	8	C
11	64	<i>Reading and Literature</i>	15	A
12	65	<i>Reading and Literature</i>	12	C
13	65	<i>Reading and Literature</i>	12	A
14	65	<i>Reading and Literature</i>	15	D
15	65	<i>Reading and Literature</i>	12	A
16	66	<i>Reading and Literature</i>	12	C
17	66	<i>Language</i>	4	C
18	66	<i>Reading and Literature</i>	12	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

Grade 6 English Language Arts
Reading Comprehension
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
19	<i>Reading and Literature</i>	14
20	<i>Reading and Literature</i>	14
21	<i>Reading and Literature</i>	14
22	<i>Reading and Literature</i>	14
23	<i>Reading and Literature</i>	14
24	<i>Reading and Literature</i>	14
25	<i>Reading and Literature</i>	13
26	<i>Reading and Literature</i>	8
27	<i>Reading and Literature</i>	13
28	<i>Reading and Literature</i>	13
29	<i>Reading and Literature</i>	13
30	<i>Reading and Literature</i>	13
31	<i>Reading and Literature</i>	15
32	<i>Reading and Literature</i>	13
33	<i>Language</i>	5
34	<i>Language</i>	4
35	<i>Reading and Literature</i>	13
36	<i>Reading and Literature</i>	11
37	<i>Reading and Literature</i>	8
38	<i>Reading and Literature</i>	11
39	<i>Reading and Literature</i>	8
40	<i>Language</i>	5

VI. English Language Arts, Grade 7

A. Composition

B. Reading Comprehension

Grade 7 English Language Arts Test

Test Structure

The grade 7 English Language Arts test was presented in the following two parts:

- the ELA Composition test, which used a writing prompt to assess learning standards from the Massachusetts *English Language Arts Curriculum Framework*'s **Composition** strand
- the ELA Reading Comprehension test, which used multiple-choice and open-response questions (items) to assess learning standards from the *English Language Arts Curriculum Framework*'s **Language** and **Reading and Literature** strands

A. Composition

The spring 2012 grade 7 English Language Arts (ELA) Composition test and Composition Make-Up test were based on learning standards in the Composition strand of the Massachusetts *English Language Arts Curriculum Framework* (2001). The learning standards for the Composition strand appear on pages 72–83 of the *Framework*, which is available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Composition test results are reported under the reporting categories **Composition: Topic Development** and **Composition: Standard English Conventions**.

Test Sessions and Content Overview

The ELA Composition test included two separate test sessions, administered on the same day with a short break between sessions. During the first session, each student wrote an initial draft of a composition in response to the appropriate writing prompt on the next page. During the second session, each student revised his or her draft and submitted a final composition, which was scored in the areas of Topic Development and Standard English Conventions. The Scoring Guides for the MCAS English Language Arts Composition are available at www.doe.mass.edu/mcas/student/elacomp_scoreguide.html.

Reference Materials

At least one English-language dictionary per classroom was provided for student use during ELA Composition test sessions. The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only. No other reference materials were allowed during either ELA Composition test session.

Cross-Reference Information

Framework general standards 19–22 are assessed by the ELA Composition.

English Language Arts Test

Grade 7 Writing Prompt

WRITING PROMPT

Imagine that for one day you could trade places with anyone you choose. The person could be real or imaginary, from the past or from the present.

In a well-developed composition, identify the person you would want to trade places with, explain why you would like to trade places with this person, and describe how your day would be different as this person.

Grade 7 Make-Up Writing Prompt

WRITING PROMPT

Think about a trend that has influenced young people, such as texting or wearing certain types of clothing.

In a well-developed composition, identify a trend, explain why it is popular, and describe how it influences young people.

B. Reading Comprehension

The spring 2012 grade 7 English Language Arts Reading Comprehension test was based on learning standards in the two content strands of the Massachusetts *English Language Arts Curriculum Framework* (2001) listed below. Specific learning standards for grade 7 are found in the *Supplement to the Massachusetts English Language Arts Curriculum Framework* (2004). Page numbers for the learning standards appear in parentheses.

■ Language (*Framework*, pages 19–26; *Supplement*, page 14)

■ Reading and Literature (*Framework*, pages 35–64; *Supplement*, pages 15–17)

The *English Language Arts Curriculum Framework* and *Supplement* are available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Reading Comprehension test results are reported under two MCAS reporting categories, **Language** and **Reading and Literature**, which are identical to the two framework content strands listed above.

Test Sessions and Content Overview

The grade 7 ELA Reading Comprehension test included two separate test sessions. Each session included reading passages, followed by multiple-choice and open-response questions. Selected common reading passages and approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both ELA Reading Comprehension test sessions. No other reference materials were allowed during any ELA Reading Comprehension test session.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework general standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

English Language Arts

READING COMPREHENSION

DIRECTIONS

This session contains two reading selections with seventeen multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

The Panama Canal, which enables boats to travel through the country of Panama instead of sailing around South America, is one of the most famous structures in the world. Read the article about how it was built and answer the questions that follow.

PANAMA CANAL

1 **A** jungle, an untamed river and disease — a formidable trio that made building a canal across the country of Panama an almost impossible dream.

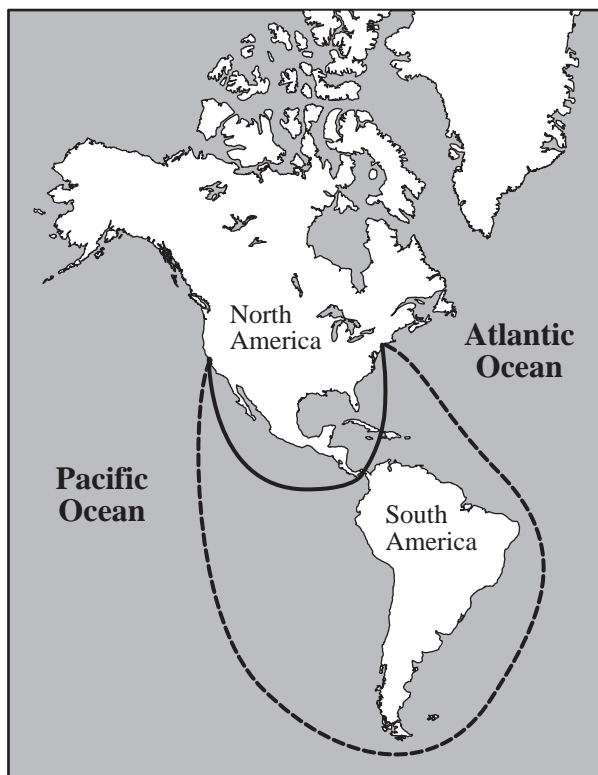
2 Construction was impossible for a French company already famous for building the Suez Canal in Egypt. They had tried it and failed in the late 1880s. The Americans took over in 1904, and it took ten years to complete the 82 km (51 mi.) long canal through Panama. For ships, it was a huge improvement — instead of traveling around the tip of South America, they could travel across Panama and shave 14,400 km (9000 mi.) from trips between New York and San Francisco.

3 How did engineers pull off this amazing feat? Window screens, for starters.

Little Insects, Big Problems

4 During the French canal effort, yellow fever and malaria killed thousands of workers. There's definitely a problem with a building project when three out of four workers die from disease.

5 When the Americans took over, they ran into the same problem. In fact, most of the American workers booked passage home. That's where the window screens came in. The canal's Chief Sanitary Officer, Dr. William Gorgas, believed in a new theory — mosquitoes spread the diseases.



The dotted line shows the route ships had to take before the Panama Canal was built. The solid line shows the new, faster route.

6 His team first attacked the mosquito that carries yellow fever. It likes to live near humans, so Dr. Gorgas targeted Panama City. All standing water — a great place for mosquitoes to lay eggs — was eradicated, and mosquito netting and running water were provided to workers. Windows and doors were screened, and in

Reading Comprehension

a matter of months yellow fever was wiped out in the city.

- 7 Attacking malaria-carrying mosquitoes, however, was like going after a jungle of beasts, Dr. Gorgas said. They live just about everywhere, and the malaria they carry kills more people than yellow fever. After researching the mosquito's habits, the team drained swamps, cleared vegetation, sprayed oil on standing water, released minnows to eat mosquito larvae and bred spiders, ants and lizards to feed on the adult insects. Malaria cases dropped.

- 8 With disease under control, Chief Engineer John Stevens turned to keeping the workers happy. While half of the 24,000 laborers were digging a giant "ditch" across Panama, the other half were constructing towns complete with houses, dining halls, hospitals, hotels, churches and schools for workers and their families. They even started a baseball league.

The Big Ditch

- 9 Some canals are literally big ditches. Ships sail in one end and out the other. But a different solution was needed in Panama. A "lake and lock" design was adopted. Panama's Chagres River would be dammed to create a new lake, called Gatún Lake, in the interior. A series of locks would raise ships from the Atlantic Ocean to the lake

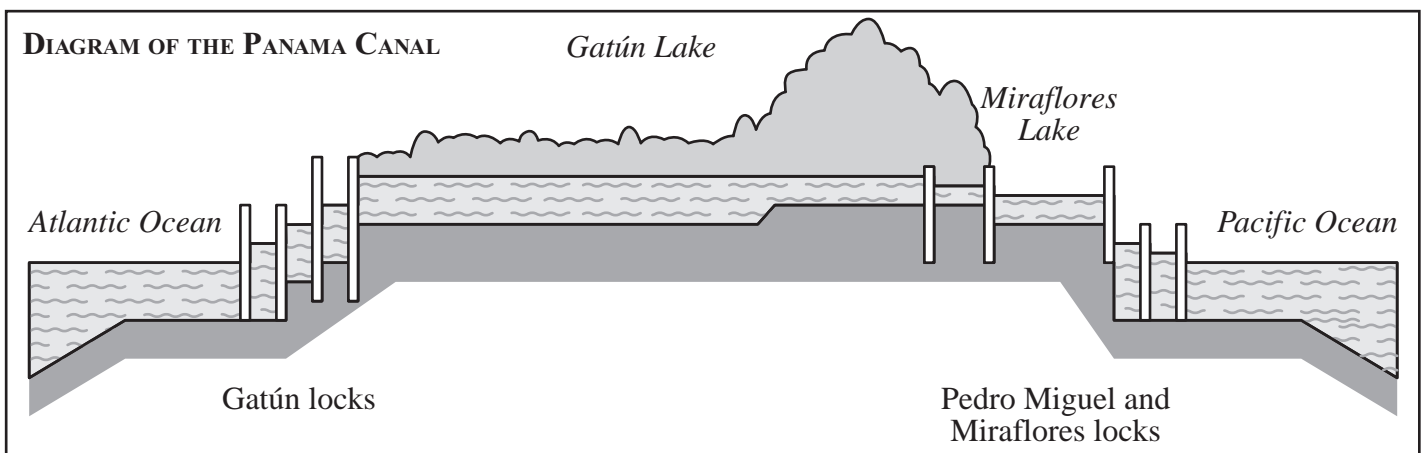
level. Ships would cross Gatún Lake, then descend another set of locks to the Pacific Ocean. It would be a bit like climbing steps, crossing a field and going down another set of steps on the other side.

- 10 The digging began. Dynamite was used to clear rock and loosen the rock-hard clay of the canal. Then rock and soil (called "spoil") were dug out and loaded onto trains for removal.

- 11 The biggest challenge was the steep, landslide-prone Culebra Cut. There, spoil trains traveled to different levels to haul out about 76 million m³ (100 million cu. yd.) of rock and soil. That's enough to fill the Empire State Building almost 76 times. When the digging was done, the 14 km (8.75 mi.) long Culebra Cut looked like the Grand Canyon. At places its sides were as high as a 25-story building. Some of its spoil was used to build dams, a breakwater in Panama Bay, a townsite and a military base.

Layin' the Locks

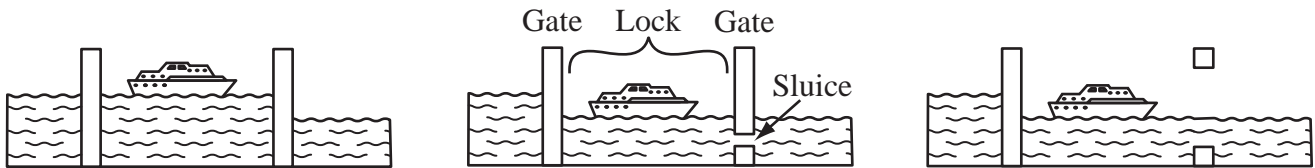
- 12 The locks — all twelve of them — are considered an engineering triumph. They were the first to be operated by electricity and the first made of a relatively new material: concrete.
- 13 The canal actually has two "traffic lanes" — six locks for ships going from



Reading Comprehension

HOW A LOCK WORKS

A lock is just two sets of doors with room big enough for a ship between them. Here's how a ship goes down through a lock.



1. A ship enters a lock and the gates close behind it.
2. Water drains out through sluices to lower the water level in the lock.
3. The gates in front open and the ship sails out.

the Pacific to the Atlantic and another six locks for ships going from the Atlantic to the Pacific.

- 14 When entering from the Atlantic side, three locks lift ships about 26 m (85 ft.) to Gatún Lake. From Gatún Lake, the ships are lowered 9.5 m (31 ft.) through one lock to Miraflores Lake. Two more locks at Miraflores lower ships to the Pacific Ocean.

A (Very Quiet) Drumroll, Please

- 15 The first trip through the canal by a self-propelled, ocean-going vessel took place on



More than 880,000 vessels have passed through the Panama Canal since it was officially opened in 1914.

January 7, 1914. The *Alexandre La Valley*, an old French crane boat, went from the Atlantic to the Pacific.

- 16 The Panama Canal was officially opened on August 15, 1914. Beginning with the French initiative, it had taken more than half a billion dollars and tens of thousands of workers to build the canal. Many thousands died. Despite all this, the news of its opening was met with little hoopla* — World War I had just erupted.

- The Panama Canal can handle about fifty ships per day. On average, it takes a ship eight to ten hours to pass completely through the canal.
- Ships pay a toll — based on cargo volume and measurements — to use the canal. The highest toll ever was \$165,235.58, paid by the cruise ship *Rhapsody of the Seas* on April 15, 1998. The lowest toll was thirty-six cents, paid by Richard Halliburton who swam the canal in 1928.

* hoopla — public excitement

Reading Comprehension

- 1 What is the **main** purpose of the question in paragraph 3?
- A. to lead in to the next topic
 - B. to reveal the author's opinion
 - C. to highlight the workers' skills
 - D. to explain how the canal was built

- 2 Which of the following statements is **best** supported by the information in the section "Little Insects, Big Problems"?
- A. Yellow fever is a more serious illness than malaria.
 - B. Dr. Gorgas had to convince engineers to prevent illness.
 - C. Dr. Gorgas had previously studied the habits of mosquitoes.
 - D. Yellow fever and malaria are carried by different types of mosquitoes.

- 3 Read the sentence from paragraph 9 in the box below.

It would be a bit like climbing steps, crossing a field and going down another set of steps on the other side.

What is the **main** purpose of the sentence?

- A. to describe how the "lake and lock" design works
- B. to demonstrate a weakness in the "lake and lock" design
- C. to compare the "lake and lock" design to other canal designs
- D. to show how the "lake and lock" design reduces the length of the canal

- 4 What is the **most likely** purpose of the text box at the end of the article?
- A. to explain the history of the canal
 - B. to give interesting facts about the canal
 - C. to show how much it costs to use the canal
 - D. to explain the types of ships that use the canal

Reading Comprehension

5 Based on paragraph 1, what does the word *formidable* mean?

- A. wild
- B. difficult
- C. unfamiliar
- D. unexplored

6 Read the sentences from paragraph 6 in the box below.

His team first attacked the mosquito that carries yellow fever. It likes to live near humans, so Dr. Gorgas targeted Panama City.

In the sentences, what does the pronoun “it” refer to?

- A. team
- B. mosquito
- C. yellow fever
- D. humans

Question 7 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 7 in the space provided in your Student Answer Booklet.

7 Based on the article, explain the obstacles to building the Panama Canal **and** how each obstacle was overcome. Support your answer with important and specific details from the article.

Reading Comprehension

The American Indian narrator of this excerpt transferred from his troubled school on an Indian reservation to attend an all-white high school where the only other Indian is the school mascot. In this excerpt, his new school's basketball team clashes with his old school's team, led by his friend, Rowdy. Read the excerpt and answer the questions that follow.

from **The Absolutely True Diary of a Part-Time Indian**

by Sherman Alexie

- 1 I kept glancing over at Wellpinit as they ran their lay-up drills. And I noticed
that Rowdy kept glancing over at us.
- 2 At me.
- 3 Rowdy and I pretended that we weren't looking at each other. But, man, oh, man,
we were sending some serious hate signals across the gym.
- 4 I mean, you have to love somebody that much to also hate them that much, too.
- 5 Our captains, Roger and Jeff, ran out to the center circle to have the game talk
with the refs.
- 6 Then our band played the "Star-Spangled Banner."
- 7 And then our five starters, including me, ran out to the center circle to go to
battle against Wellpinit's five.
- 8 Rowdy smirked at me as I took my position next to him.
- 9 "Wow," he said. "You guys must be desperate if you're starting."
- 10 "I'm guarding you," I said.
- 11 "What?"
- 12 "I'm guarding you tonight."
- 13 "You can't stop me. I've been kicking your butt for fourteen years."
- 14 "Not tonight," I said. "Tonight's my night."
- 15 Rowdy just laughed.
- 16 The ref threw up the opening jump ball.
- 17 Our big guy, Roger, tipped it back toward our point guard, but Rowdy was quicker.
He intercepted the pass and raced toward his basket. I ran right behind him. I knew
that he wanted to dunk it. I knew that he wanted to send a message to us.
- 18 I knew he wanted to humiliate us on the opening play.
- 19 And for a second, I wondered if I should just intentionally foul him and prevent
him from dunking. He'd get two free throws but those wouldn't be nearly as exciting
as a dunk.
- 20 But, no, I couldn't do that. I couldn't foul him. That would be like giving up.
So I just sped up and got ready to jump with Rowdy.
- 21 I knew he'd fly into the air about five feet from the hoop. I knew he'd jump
about two feet higher than I could. So I needed to jump quicker.
- 22 And Rowdy rose into the air. And I rose with him.
- 23 **AND THEN I ROSE ABOVE HIM!**
- 24 Yep, if I believed in magic, in ghosts, then I think maybe I was rising on the
shoulders of my dead grandmother and Eugene, my dad's best friend. Or maybe I
was rising on my mother and father's hopes for me.
- 25 I don't know what happened.

Reading Comprehension

- 26 But for once, and for the only time in my life, I jumped higher than Rowdy.
27 I rose above him as he tried to dunk it.
28 I TOOK THE BALL RIGHT OUT OF HIS HANDS!
29 Yep, we were, like, ten feet off the ground, but I was still able to reach out and steal the ball from Rowdy.
30 Even in midair, I could see the absolute shock on Rowdy's face. He couldn't believe I was flying with him.
31 He thought he was the only Indian Superman.
32 I came down with the ball, spun, and dribbled back toward our hoop. Rowdy, screaming with rage, was close behind me.
33 Our crowd was insanely loud.
34 They couldn't believe what I'd just done.
35 I mean, sure, that kind of thing happens in the NBA and in college and in the big high schools. But nobody jumped like that in a small school basketball gym. Nobody blocked a shot like that.
36 NOBODY TOOK A BALL OUT OF A GUY'S HANDS AS HE WAS JUST ABOUT TO DUNK!
37 But I wasn't done. Not by a long shot. I wanted to score. I'd taken the ball from Rowdy and now I wanted to score in his face. I wanted to absolutely demoralize him.
38 I raced for our hoop.
39 Rowdy was screaming behind me.
40 My teammates told me later that I was grinning like an idiot as I flew down the court.
41 I didn't know that.
42 I just knew I wanted to hit a jumper in Rowdy's face.
43 Well, I wanted to dunk on him. And I figured, with the crazy adrenaline coursing through my body, I might be able to jump over the rim again. But I think part of me knew that I'd never jump like that again. I only had that one epic jump in me.
44 I wasn't a dunker; I was a shooter.
45 So I screeched to a stop at the three-point line and head-faked. And Rowdy completely fell for it. He jumped high over me, wanting to block my shot, but I just waited for the sky to clear. As Rowdy hovered above me, as he floated away, he looked at me. I looked at him.
46 He knew he'd blown it. He knew he'd fallen for a little head-fake. He knew he could do nothing to stop my jumper.
47 He was sad, man.
48 Way sad.
49 So guess what I did?
50 I stuck my tongue out at him. Like I was Michael Jordan.
51 I mocked him.
52 And then I took my three-pointer and buried it. Just swished that sucker.
53 AND THE GYM EXPLODED!
54 People wept.
55 Really.

Reading Comprehension

- 56 My dad hugged the white guy next to him. Didn't even know him. But hugged and kissed him like they were brothers, you know?
- 57 My mom fainted. Really. She just leaned over a bit, bumped against the white woman next to her, and was gone.
- 58 She woke up five seconds later.
- 59 People were up on their feet. They were high-fiving and hugging and dancing and singing.
- 60 The school band played a song. Well, the band members were all confused and excited, so they played a song, sure, but each member of the band played a different song.
- 61 My coach was jumping up and down and spinning in circles.
- 62 My teammates were screaming my name.
- 63 Yep, all of that fuss and the score was only 3 to 0.
- 64 But, trust me, the game was over.
- 65 It only took, like, ten seconds to happen. But the game was already over. Really. It can happen that way. One play can determine the course of a game. One play can change your momentum forever.
- 66 We beat Wellpinit by forty points.
- 67 Absolutely destroyed them.
- 68 That three-pointer was the only shot I took that night. The only shot I made.
- 69 Yep, I only scored three points, my lowest point total of the season.
- 70 But Rowdy only scored four points.
- 71 I stopped him.
- 72 I held him to four points.
- 73 Only two baskets.
- 74 He scored on a layup in the first quarter when I tripped over my teammate's foot and fell.
- 75 And he scored in the fourth quarter, with only five seconds left in the game, when he stole the ball from me and raced down for a layup.
- 76 But I didn't even chase him down because we were ahead by forty-two points.
- 77 The buzzer sounded. The game was over. . . . Yep, we had humiliated them.
- 78 We were dancing around the gym, laughing and screaming and chanting.
- 79 My teammates mobbed me. They lifted me up on their shoulders and carried me around the gym.
- 80 I looked for my mom, but she'd fainted again, so they'd taken her outside to get some fresh air.
- 81 I looked for my dad.
- 82 I thought he'd be cheering. But he wasn't. He wasn't even looking at me. He was all quiet-faced as he looked at something else.
- 83 So I looked at what he was looking at.
- 84 It was the Wellpinit Redskins, lined up at their end of the court, as they watched us celebrate our victory.
- 85 I whooped.

Reading Comprehension

- 86 We had defeated the enemy! We had defeated the champions! We were David who'd thrown a stone into the brain of Goliath!*
- 87 And then I realized something.
- 88 I realized that my team, the Reardan Indians, was Goliath.
- 89 I mean, jeez, all of the seniors on our team were going to college. All of the guys on our team had their own cars. All of the guys on our team had iPods and cell phones and PSPs and three pairs of blue jeans and ten shirts and mothers and fathers who went to church and had good jobs.
- 90 Okay, so maybe my white teammates had problems, serious problems, but none of their problems was life threatening.
- 91 But I looked over at the Wellpinit Redskins, at Rowdy.

* *David and Goliath* — referring to the biblical story where the weaker man, David, kills the stronger Goliath in battle

The Absolutely True Diary of a Part-Time Indian by Sherman Alexie. Copyright © 2007 by Sherman Alexie. Reprinted by permission of Little, Brown & Company.

- 8 Based on paragraphs 8–15, what is Rowdy's attitude toward competing against the narrator?
- A. He is glad to see the narrator again.
 - B. He is worried that the narrator has improved.
 - C. He is confident he will embarrass the narrator.
 - D. He is angry that the narrator has chosen to play.

- 9 In the excerpt, what is the **most likely** purpose of putting certain sentences in capital letters?
- A. to emphasize the narrator's amazement
 - B. to emphasize the confusion of the crowd
 - C. to emphasize the main idea of the excerpt
 - D. to emphasize the unfairness of the narrator's actions

Reading Comprehension

- 10 Based on paragraph 19, why does the narrator consider fouling Rowdy?
- A. He wants to show Rowdy that he is a better player.
 - B. He wants to show Rowdy that he is unafraid of him.
 - C. He wants to prevent Rowdy from taking control of the game.
 - D. He wants to prevent Rowdy from playing the rest of the game.
- 11 In paragraph 24, what does the narrator credit his “rising” to?
- A. his transfer to Reardan
 - B. the adrenaline in his body
 - C. his friendship with Rowdy
 - D. the inspiration of his loved ones

- 12 Read paragraph 46 in the box below.

He knew he'd blown it. He knew he'd fallen for a little head-fake. He knew he could do nothing to stop my jumper.

What does the repetition of “He knew” **mainly** emphasize?

- A. Rowdy's skill
 - B. Rowdy's courage
 - C. Rowdy's exhaustion
 - D. Rowdy's helplessness
- 13 According to the excerpt, how do the narrator's steal and three-point basket affect the people in the gym?
- A. The people are unable to contain their joy.
 - B. The people are relieved that the game is over.
 - C. The people are upset that the narrator outplayed his opponent.
 - D. The people are disappointed the narrator did not dunk the ball.

Reading Comprehension

- 14 Read the sentences from paragraph 65 in the box below.

One play can determine the course of a game. One play can change your momentum forever.

What does the narrator imply in the sentences?

- A. He will decide to stop playing basketball.
- B. His happiness about the game would not last long.
- C. His parents will be disappointed with his performance.
- D. The experience would have a strong impact on his life.

- 15 What do the short sentences in paragraphs 65–73 emphasize?

- A. the sadness of the Wellpinit players
- B. the connection the narrator has to Wellpinit
- C. the significance of the narrator's achievements
- D. the narrator's desire to return to his former school

- 16 In the excerpt, what is the **most important** effect of using a first-person narrator?

- A. It allows the reader to understand the author's opinion.
- B. It allows the reader to understand the theme of the excerpt.
- C. It allows the reader to understand the emotions of the crowd.
- D. It allows the reader to understand the main character's emotions.

Reading Comprehension

- 17** Which of the following sentences represents an important change in the mood of the excerpt?
- A. “The ref threw up the opening jump ball.” (paragraph 16)
 - B. “Our crowd was insanely loud.” (paragraph 33)
 - C. “The buzzer sounded. The game was over.” (paragraph 77)
 - D. “I thought he’d be cheering. But he wasn’t.” (paragraph 82)

- 18** Based on paragraph 43, what does the word *coursing* mean?
- A. spreading pain
 - B. moving rapidly
 - C. creating numbness
 - D. disappearing slowly

Question 19 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 19 in the space provided in your Student Answer Booklet.

- 19** Describe the narrator’s changing feelings throughout the excerpt. Support your answer with important and specific information from the excerpt.

**Grade 7 English Language Arts
Reading Comprehension
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	76	<i>Reading and Literature</i>	13	A
2	76	<i>Reading and Literature</i>	13	D
3	76	<i>Reading and Literature</i>	13	A
4	76	<i>Reading and Literature</i>	13	B
5	77	<i>Language</i>	4	B
6	77	<i>Language</i>	5	B
7	77	<i>Reading and Literature</i>	13	
8	81	<i>Reading and Literature</i>	12	C
9	81	<i>Reading and Literature</i>	15	A
10	82	<i>Reading and Literature</i>	12	C
11	82	<i>Reading and Literature</i>	8	D
12	82	<i>Reading and Literature</i>	15	D
13	82	<i>Reading and Literature</i>	12	A
14	83	<i>Reading and Literature</i>	12	D
15	83	<i>Reading and Literature</i>	15	C
16	83	<i>Reading and Literature</i>	12	D
17	84	<i>Reading and Literature</i>	12	D
18	84	<i>Language</i>	4	B
19	84	<i>Reading and Literature</i>	12	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

**Grade 7 English Language Arts
Reading Comprehension
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards**

Item No.	Reporting Category	Standard
20	<i>Reading and Literature</i>	12
21	<i>Reading and Literature</i>	15
22	<i>Reading and Literature</i>	12
23	<i>Reading and Literature</i>	15
24	<i>Language</i>	4
25	<i>Reading and Literature</i>	12
26	<i>Reading and Literature</i>	13
27	<i>Reading and Literature</i>	13
28	<i>Reading and Literature</i>	13
29	<i>Reading and Literature</i>	13
30	<i>Reading and Literature</i>	15
31	<i>Reading and Literature</i>	13
32	<i>Reading and Literature</i>	13
33	<i>Language</i>	4
34	<i>Language</i>	4
35	<i>Reading and Literature</i>	13
36	<i>Reading and Literature</i>	8
37	<i>Reading and Literature</i>	14
38	<i>Reading and Literature</i>	14
39	<i>Reading and Literature</i>	11
40	<i>Language</i>	4

VII. English Language Arts, Reading Comprehension, Grade 8

Grade 8 English Language Arts

Reading Comprehension Test

The spring 2012 grade 8 English Language Arts Reading Comprehension test was based on learning standards in the two content strands of the Massachusetts *English Language Arts Curriculum Framework* (2001) listed below. Page numbers for the learning standards appear in parentheses.

- Language (*Framework*, pages 19–26)
- Reading and Literature (*Framework*, pages 35–64)

The *English Language Arts Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Reading Comprehension test results are reported under two MCAS reporting categories, **Language** and **Reading and Literature**, which are identical to the two framework content strands listed above.

Test Sessions and Content Overview

The grade 8 ELA Reading Comprehension test included two separate test sessions. Each session included reading passages, followed by multiple-choice and open-response questions. Selected common reading passages and approximately half of the common test items are shown on the following pages as they appeared in test booklets. Due to copyright restrictions, certain reading passages cannot be released to the public on the website. For further information, contact Student Assessment Services at 781-338-3625.

Reference Materials

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both ELA Reading Comprehension sessions. No other reference materials were allowed during any ELA Reading Comprehension test session.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item’s reporting category and the framework general standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

English Language Arts

READING COMPREHENSION

DIRECTIONS

This session contains two reading selections with sixteen multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

In this excerpt from The Conch Bearer, a novel by Chitra Banerjee Divakaruni, a boy named Anand and his sister Meera live in India, where Anand encounters a stranger. Read the excerpt and answer the questions that follow.

A Strange Old Man

from *The Conch Bearer* by Chitra Banerjee Divakaruni

Students read a selection titled “A Strange Old Man” from *The Conch Bearer* and then answered questions 1 through 11 that follow on pages 92 through 96 of this document.

Due to copyright restrictions, the selection cannot be released to the public over the Internet. For more information, see the copyright citation below.

“A Strange Old Man” by Chitra Banerjee Divakaruni, from *The Conch Bearer*. Copyright © 2003 by Chitra Banerjee Divakaruni. Reprinted by permission of Henry Holt and Company, LLC.

Reading Comprehension

Due to copyright restrictions, the selection that appeared on this page cannot be released to the public over the Internet. For more information, see the citation on the previous page.

Due to copyright restrictions, the selection that appeared on this page cannot be released to the public over the Internet. For more information, see the citation on page 89.

Reading Comprehension

- 1 According to paragraphs 1 and 2, what is **most** upsetting to Anand?
- A. being dirty
 - B. being young
 - C. being unable to attend school
 - D. being unpopular with the children
- 2 Reread paragraph 9. The details in the paragraph **mostly** emphasize the contrast between
- A. hope and reality.
 - B. the past and the future.
 - C. Anand and the old man.
 - D. Anand and other children.

- 3 Read the sentences from paragraph 11 in the box below.

Two college students—a young man and his girlfriend, Anand guessed—asked for a plate of pooris and alu dum. Anand’s stomach growled, embarrassing him terribly, as he brought over the puffed fried bread and spicy potatoes, and the young woman gave him a curious look.

The woman in the tea stall **most likely** gives Anand a “curious look” because she wonders

- A. if he notices the old man.
- B. if she recognizes him.
- C. if her food is cold.
- D. if he is hungry.

Reading Comprehension

- 4 Read the details from the excerpt in the box below.

- dirty shirt with a button missing (paragraph 2)
- walked across the floor of the shack (paragraph 3)
- swirling dust and torn newspapers along the street (paragraph 18)
- wrapped a few stale pooris in a torn newspaper (paragraph 27)

What do the details **most** emphasize?

- A. the fashions of the time
- B. the poverty of the setting
- C. the dryness of the environment
- D. the determination of the characters

- 5 Based on paragraph 23, what is **mostly** revealed about Anand's relationship with Haru?

- A. Anand admires Haru.
- B. Anand is grateful to Haru.
- C. Anand is rarely polite to Haru.
- D. Anand knows how to deal with Haru.

- 6 Read the sentence from paragraph 31 in the box below.

His voice was deep and gravelly, as though it came from the bottom of the river, and he spoke the Bengali words with a slight accent, as though he had come from elsewhere.

What does the sentence **mostly** emphasize about the old man's voice?

- A. It is not very inviting.
- B. It is not very forceful.
- C. It has an irritating quality.
- D. It has an unfamiliar quality.

Reading Comprehension

- 7 Read the details from the excerpt in the box below.

- The old man raised the glass in a strong smooth motion that surprised Anand . . . (paragraph 30)
- He made a small sign in the air above Anand's head, . . . (paragraph 31)
- . . . he turned and, moving unexpectedly fast, disappeared . . . (paragraph 31)
- What else could account for the warmth . . . (paragraph 32)

What is the **most likely** reason the author includes these details in the excerpt?

- A. They show ancient rituals.
- B. They suggest a dangerous conflict.
- C. They reveal a mysterious side to the old man.
- D. They emphasize the depression of the old man.

- 8 Which quotation **best** represents an example of foreshadowing in the excerpt?

- A. “. . . they swung their brightly colored satchels.” (paragraph 1)
- B. “. . . until it connected with something—or someone.” (paragraph 9)
- C. “‘Out! Out!’ Haru yelled more loudly.” (paragraph 17)
- D. “Haru frowned. ‘What’s the matter?’ he said nastily.” (paragraph 24)

Reading Comprehension

9 Which of the following quotations **best** states an overall theme of the excerpt?

- A. “He wanted so much to be like them—and knew so well that it was out of his reach.” (paragraph 1)
- B. “. . . *as though I were a bad smell, . . .*” (paragraph 2)
- C. “But he also knew he was lucky to find a job at all.” (paragraph 6)
- D. “*Sharing what you have with others really makes you feel good.*” (paragraph 32)

10 In paragraph 20, what does the word *docilely* mean?

- A. obediently
- B. excitedly
- C. proudly
- D. slowly

Reading Comprehension

Question 11 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 11 in the space provided in your Student Answer Booklet.

- 11** Based on the excerpt, explain Anand's motivation for helping the old man. Support your answer with relevant and specific details from the excerpt.

Reading Comprehension

Read the selection and answer the questions that follow.

How To Eat A GUAVA

from *When I Was Puerto Rican* by Esmeralda Santiago

1 *Barco que no anda, no llega a puerto.*
A ship that doesn't sail, never reaches port.

2 **T**here are guavas at the Shop & Save. I pick one the size of a tennis ball and finger the prickly stem end. It feels familiarly bumpy and firm. The guava is not quite ripe; the skin is still a dark green. I smell it and imagine a pale pink center, the seeds tightly embedded in the flesh.

3 A ripe guava is yellow, although some varieties have a pink tinge. The skin is thick, firm, and sweet. Its heart is bright pink and almost solid with seeds. The most delicious part of the guava surrounds the tiny seeds. If you don't know how to eat a guava, the seeds end up in the crevices between your teeth.

4 When you bite into a ripe guava, your teeth must grip the bumpy surface and sink into the thick edible skin without hitting the center. It takes experience to do this, as it's quite tricky to determine how far beyond the skin the seeds begin.

5 Some years, when the rains have

been plentiful and the nights cool, you can bite into a guava and not find many seeds. The guava bushes grow close to the ground, their branches laden with green then yellow fruit that seem to ripen overnight. These guavas are large and juicy, almost seedless, their roundness enticing you to have one more, just one more, because next year the rains may not come.

6 As children, we didn't always wait for the fruit to ripen. We raided the bushes as soon as the guavas were large enough to bend the branch.

7 A green guava is sour and hard. You bite into it at its widest point, because it's easier to grasp with your teeth. You hear the skin, meat, and seeds crunching inside your head, while the inside of your mouth explodes in little spurts of sour.

8 You grimace, your eyes water, and your cheeks disappear as your lips purse into a tight O. But you have another and then another, enjoying the crunchy sounds, the acid taste, the gritty texture of the unripe center. At night, your mother makes you drink castor oil,* which she says tastes

* *castor oil* — oil made from castor beans, used as a home remedy for digestive problems

Reading Comprehension

better than a green guava. That's when you know for sure that you're a child and she has stopped being one.

- 9 I had my last guava the day we left Puerto Rico. It was large and juicy, almost red in the center, and so fragrant that I didn't want to eat it because I would lose the smell. All the way to the airport I scratched at it with my teeth, making little dents in the skin, chewing small pieces with my front teeth, so that I could feel the texture against my tongue, the tiny pink pellets of sweet.

- 10 Today, I stand before a stack of dark green guavas, each perfectly round and hard, each \$1.59. The one in my hand is tempting. It smells faintly of late summer afternoons and hopscotch under the mango tree. But this is autumn in New York, and I'm no longer a child.

- 11 The guava joins its sisters under the harsh fluorescent lights of the exotic fruit display. I push my cart away, toward the apples and pears of my adulthood, their nearly seedless ripeness predictable and bittersweet.

Meet the Writer

Esmeralda Santiago

Between Two Worlds

- 12 Esmeralda Santiago (1948–) grew up in Puerto Rico, the eldest of eleven children. At the age of thirteen, she moved to New York City with her mother, her brothers, and her sisters. Living in Puerto Rico and in New York, she says, has to some extent made her feel that she doesn't quite fit into either culture—a feeling she highlights in the title of her memoir, *When I Was Puerto Rican*. In a note to readers of the book she writes:

- 13 “When I returned to Puerto Rico after living in New York for seven years, I was told I was no longer Puerto Rican because my Spanish was rusty, my gaze too direct,

my personality too assertive. . . . Yet, in the United States, my darkness, my accented speech, my frequent lapses into confused silence between English and Spanish identified me as foreign, non-American. In writing the book I wanted to get back to that feeling of Puertoricanness I had before I came here. Its title reflects who I was then, and asks, who am I today? ”

- 14 After graduating from Harvard University, Santiago earned a master's degree from Sarah Lawrence College. She currently lives in Westchester County, New York. Now, after years of struggling with not being entirely at home in her two cultures, Santiago says she defines *home* “as the place where I am.”

“How to Eat a Guava” by Esmeralda Santiago, from *When I Was Puerto Rican*. Copyright © 2006 by Perseus Books Group. Reprinted by permission of Rightslink for Perseus Books. “Meet the Writer: Esmeralda Santiago” from *Elements of Literature*, Ohio Student Edition. Copyright © 2005 by Holt, Rinehart and Winston. Reprinted by permission of Houghton Mifflin Harcourt Publishing Company.

Reading Comprehension

- 12 According to the selection, what does eating a guava **mainly** require?
- A. time
 - B. daring
 - C. practice
 - D. inspiration
- 13 According to paragraph 9, why does Santiago want to save her guava?
- A. She wants to extend her appreciation of it.
 - B. She wants to give it to her mother as a present.
 - C. She wants to plant it near her new home.
 - D. She wants to eat it when she is hungry.
- 14 According to paragraphs 12–14, why did Santiago write her book?
- A. to define what it means to be a writer
 - B. to understand what makes her American
 - C. to reconnect with her cultural background
 - D. to communicate with relatives in Puerto Rico
- 15 Which statement **best** reflects a theme of the selection?
- A. Hard work guarantees success.
 - B. Education is a key to freedom.
 - C. Our lives change as we grow older.
 - D. Our true homes are where we were born.
- 16 Which quotation from the selection is an example of personification?
- A. “I pick one the size of a tennis ball . . .”
 - B. “We raided the bushes as soon as the guavas were large enough . . .”
 - C. “It smells faintly of late summer afternoons and hopscotch . . .”
 - D. “The guava joins its sisters under the harsh fluorescent lights . . .”
- 17 Based on paragraphs 7 and 8, a *grimace* is a facial expression of
- A. anger.
 - B. sadness.
 - C. discomfort.
 - D. nervousness.

Reading Comprehension

Question 18 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 18 in the space provided in your Student Answer Booklet.

- 18** Based on the selection, explain how Santiago feels about growing up in two cultures. Support your answer with relevant and specific details from the selection.

Grade 8 English Language Arts
Reading Comprehension
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	92	<i>Reading and Literature</i>	12	C
2	92	<i>Reading and Literature</i>	12	A
3	92	<i>Reading and Literature</i>	12	D
4	93	<i>Reading and Literature</i>	15	B
5	93	<i>Reading and Literature</i>	12	D
6	93	<i>Reading and Literature</i>	12	D
7	94	<i>Reading and Literature</i>	12	C
8	94	<i>Reading and Literature</i>	12	B
9	95	<i>Reading and Literature</i>	11	D
10	95	<i>Language</i>	4	A
11	96	<i>Reading and Literature</i>	12	
12	99	<i>Reading and Literature</i>	12	C
13	99	<i>Reading and Literature</i>	12	A
14	99	<i>Reading and Literature</i>	12	C
15	99	<i>Reading and Literature</i>	11	C
16	99	<i>Reading and Literature</i>	15	D
17	99	<i>Language</i>	4	C
18	100	<i>Reading and Literature</i>	12	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

Grade 8 English Language Arts
Reading Comprehension
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
19	<i>Reading and Literature</i>	13
20	<i>Reading and Literature</i>	13
21	<i>Reading and Literature</i>	13
22	<i>Reading and Literature</i>	13
23	<i>Reading and Literature</i>	13
24	<i>Language</i>	4
25	<i>Reading and Literature</i>	13
26	<i>Reading and Literature</i>	8
27	<i>Reading and Literature</i>	13
28	<i>Reading and Literature</i>	13
29	<i>Reading and Literature</i>	13
30	<i>Reading and Literature</i>	13
31	<i>Reading and Literature</i>	13
32	<i>Reading and Literature</i>	13
33	<i>Language</i>	6
34	<i>Language</i>	4
35	<i>Reading and Literature</i>	13
36	<i>Reading and Literature</i>	15
37	<i>Reading and Literature</i>	14
38	<i>Reading and Literature</i>	14
39	<i>Reading and Literature</i>	15
40	<i>Language</i>	4

VIII. English Language Arts, Grade 10

A. Composition

B. Reading Comprehension

Grade 10 English Language Arts Test

Test Structure

The grade 10 English Language Arts test was presented in the following two parts:

- the ELA Composition test, which used a writing prompt to assess learning standards from the Massachusetts *English Language Arts Curriculum Framework*'s **Composition** strand
- the ELA Reading Comprehension test, which used multiple-choice and open-response questions (items) to assess learning standards from the *English Language Arts Curriculum Framework*'s **Language** and **Reading and Literature** strands

A. Composition

The spring 2012 grade 10 English Language Arts (ELA) Composition test and Composition Make-Up test were based on learning standards in the Composition strand of the Massachusetts *English Language Arts Curriculum Framework* (2001). The learning standards for the Composition strand appear on pages 72–83 of the *Framework*, which is available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Composition test results are reported under the reporting categories **Composition: Topic Development** and **Composition: Standard English Conventions**.

Test Sessions and Content Overview

The ELA Composition test included two separate test sessions, administered on the same day with a short break between sessions. During the first session, each student wrote an initial draft of a composition in response to the appropriate writing prompt on the next page. During the second session, each student revised his or her draft and submitted a final composition, which was scored in the areas of Topic Development and Standard English Conventions. The Scoring Guides for the MCAS English Language Arts Composition are available at www.doe.mass.edu/mcas/student/elacomp_scoreguide.html.

Reference Materials

At least one English-language dictionary per classroom was provided for student use during ELA Composition test sessions. The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only. No other reference materials were allowed during either ELA Composition test session.

Cross-Reference Information

Framework general standards 19–22 are assessed by the ELA Composition.

English Language Arts Test

Grade 10 Writing Prompt

WRITING PROMPT

Often in works of literature, the villain has the greatest impact on the story.

Select a work of literature you have read in or out of school in which the villain has the greatest impact on the story. In a well-developed composition, identify the villain, and explain why the villain has the greatest impact on the story.

Grade 10 Make-Up Writing Prompt

WRITING PROMPT

Often in works of literature, a character feels pressure to succeed.

From a work of literature you have read in or out of school, select a character who feels pressure to succeed. In a well-developed composition, identify the character, describe how the character feels pressure to succeed, and explain how the character's experience is important to the work as a whole.

B. Reading Comprehension

The spring 2012 grade 10 English Language Arts Reading Comprehension test was based on learning standards in the two content strands of the Massachusetts *English Language Arts Curriculum Framework* (2001) listed below. Page numbers for the learning standards appear in parentheses.

■ Language (*Framework*, pages 19–26)

■ Reading and Literature (*Framework*, pages 35–64)

The *English Language Arts Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

ELA Reading Comprehension test results are reported under two MCAS reporting categories, **Language** and **Reading and Literature**, which are identical to the two framework content strands listed above.

Test Sessions and Content Overview

The grade 10 ELA Reading Comprehension test included three separate test sessions. Sessions 1 and 2 were both administered on the same day, and Session 3 was administered on the following day. Each session included reading passages, followed by multiple-choice and open-response questions. Common reading passages and test items are shown on the following pages as they appeared in test booklets. Due to copyright restrictions, certain reading passages cannot be released to the public on the website. For further information, contact Student Assessment Services at 781-338-3625.

Reference Materials

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during all three ELA Reading Comprehension test sessions. No other reference materials were allowed during any ELA Reading Comprehension test session.

Cross-Reference Information

The table at the conclusion of this chapter indicates each item’s reporting category and the framework general standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

English Language Arts

READING COMPREHENSION: SESSION 1

DIRECTIONS

This session contains three reading selections with sixteen multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

Robert Sullivan calls rats a city's "most unwanted inhabitants." But rats are also interesting animals with incredible capabilities. Read the excerpt from Rats and answer the questions that follow.

from **RATS**
by Robert Sullivan

- 1 A rat is a rodent, the most common mammal in the world. *Rattus norvegicus* is one of the approximately four hundred different kinds of rodents, and it is known by many names, each of which describes a trait or a perceived trait or sometimes a habitat: the earth rat, the roving rat, the barn rat, the field rat, the migratory rat, the house rat, the sewer rat, the water rat, the wharf rat, the alley rat, the gray rat, the brown rat, and the common rat. The average brown rat is large and stocky; it grows to be approximately sixteen inches long from its nose to its tail—the size of a large adult human male’s foot—and weighs about a pound, though brown rats have been measured by scientists and exterminators at twenty inches and up to two pounds. The brown rat is sometimes confused with the black rat, or *Rattus rattus*, which is smaller and once inhabited New York City and all of the cities of America but, since *Rattus norvegicus* pushed it out, is now relegated to a minor role. (The two species still survive alongside each other in some Southern coastal cities and on the West Coast, in places like Los Angeles, for example, where the black rat lives in attics and palm trees.) The black rat is always a very dark gray, almost black, and the brown rat is gray or brown, with a belly that can be light gray, yellow, or even a pure-seeming white. One spring, beneath the Brooklyn Bridge, I saw a red-haired brown rat that had been run over by a car. Both pet rats and laboratory rats are *Rattus norvegicus*, but they are not wild and therefore, I would emphasize, not the subject of this book. Sometimes pet rats are called fancy rats. But if anyone has picked up this book to learn about fancy rats, then they should put this book down right away; none of the rats mentioned herein are at all fancy.
- 2 Rats are nocturnal, and out in the night the brown rat’s eyes are small and black and shiny; when a flashlight shines into them in the dark, the eyes of a rat light up like the eyes of a deer. Though it forages* in darkness, the brown rat has poor eyesight. It makes up for this with, first of all, an excellent sense of smell. . . . They have an excellent sense of taste, detecting the most minute amounts of poison, down to one part per million. A brown rat has strong feet, the two front paws each equipped with four clawlike nails, the rear paws even longer and stronger. It can run and climb with squirrel-like agility. It is an excellent swimmer, surviving in rivers and bays, in sewer streams and toilet bowls.

* *forages* — looks for food

- 3 The brown rat's teeth are yellow, the front two incisors being especially long and sharp, like buckteeth. When the brown rat bites, its front two teeth spread apart. When it gnaws, a flap of skin plugs the space behind its incisors. Hence, when the rat gnaws on indigestible materials—concrete or steel, for example—the shavings don't go down the rat's throat and kill it. Its incisors grow at a rate of five inches per year. Rats always gnaw, and no one is certain why—there are few modern rat studies. It is sometimes erroneously stated that the rat gnaws solely to limit the length of its incisors, which would otherwise grow out of its head, but this is not the case: the incisors wear down naturally. In terms of hardness, the brown rat's teeth are stronger than aluminum, copper, lead, and iron. They are comparable to steel. With the alligator-like structure of their jaws, rats can exert a biting pressure of up to seven thousand pounds per square inch. Rats, like mice, seem to be attracted to wires—to utility wires, computer wires, wires in vehicles, in addition to gas and water pipes. One rat expert theorizes that wires may be attractive to rats because of their resemblance to vines and the stalks of plants; cables are the vines of the city. By one estimate, 26 percent of all electric-cable breaks and 18 percent of all phone-cable disruptions are caused by rats. According to one study, as many as 25 percent of all fires of unknown origin are rat-caused. Rats chew electrical cables. Sitting in a nest of tattered rags and newspapers, in the floorboards of an old tenement, a rat gnaws the head of a match—the lightning in the city forest.
- 4 When it is not gnawing or feeding on trash, the brown rat digs. Anywhere there is dirt in a city, brown rats are likely to be digging—in parks, in flowerbeds, in little dirt-poor backyards. They dig holes to enter buildings and to make nests. Rat nests can be in the floorboards of apartments, in the waste-stuffed corners of subway stations, in sewers, or beneath old furniture in basements. “Cluttered and unkempt alleyways in cities provide ideal rat habitat, especially those alleyways associated with food-serving establishments,” writes Robert Corrigan in *Rodent Control*, a pest control manual. “Alley rats can forage safely within the shadows created by the alleyway, as well as quickly retreat to the safety of cover in these narrow channels.” Often, rats burrow under concrete sidewalk slabs. Entrance to a typical under-the-sidewalk rat's nest is gained through a two-inch-wide hole—their skeletons collapse and they can squeeze into a hole as small as three quarters of an inch wide, the average width of their skull. This tunnel then travels about a foot down to where it widens into a nest or den. The den is lined with soft debris, often shredded plastic garbage or shopping bags, but sometimes even grasses or plants; some rat nests have been found stuffed with the gnawed shavings of the wood-based, spring-loaded snap traps that are used in attempts to kill them. The back of the den then narrows into a long tunnel that opens up on another hole back on the street. This second hole is called a bolt hole; it is an emergency exit. A bolt hole is typically covered lightly with dirt or trash—camouflage. Sometimes there are networks of burrows, which can stretch beneath a few concrete squares on a sidewalk, or a number of backyards, or even an entire city block—when *Rattus norvegicus* first came to Selkirk, England, in 1776, there were so many burrows that people feared the town might sink. Rats can also nest in basements, sewers, manholes, abandoned pipes of any kind, floorboards, or any hole or depression. “Often,” Robert Corrigan writes, “‘city rats’ will live unbeknownst to people right beneath their feet.”

- 5 Rats also inhabit subways, as most people in New York City and any city with a subway system are well aware. Every once in a while, there are reports of rats boarding trains, but for the most part rats stay on the tracks—subway workers I have talked to refer to rats as “track rabbits.” People tend to think that the subways are filled with rats, but in fact rats are not everywhere in the system; they live in the subways according to the supply of discarded human food and sewer leaks. Sometimes, rats use the subway purely for nesting purposes; they find ways through the walls of the subway stations leading from the tracks to the restaurants and stores on the street—the vibrations of subway trains tend to create rat-size cracks and holes. Many subway rats tend to live near stations that are themselves near fast-food restaurants. At the various subway stations near Herald Square, for example, people come down from the streets and throw the food that they have not eaten onto the tracks, along with newspapers and soda bottles and, I have noticed, thousands of no-longer-charged AA batteries, waiting to leak acid. The rats eat freely from the waste and sit at the side of the little streams of creamy brown sewery water that flows between the rails. They sip the water the way rats do, either with their front paws or by scooping it up with their incisors.

Rats: Observations on the History and Habitat of the City's Most Unwanted Inhabitants by Robert Sullivan. Copyright © 2004 by Robert Sullivan. Reprinted by permission of Bloomsbury USA.

- 1 In paragraph 1, what do the different rat names **mainly** show?
- A. Rats are the largest type of rodent.
 - B. There are many opinions about rats.
 - C. There is little reason to be afraid of rats.
 - D. Rats can live in a variety of environments.

- 2 What does the end of paragraph 2 **mainly** emphasize about rats?
- A. their strange diet
 - B. their physical abilities
 - C. their preference for dry land
 - D. their similarity to other mammals

3 In paragraph 3, what is the **most likely** reason the author states, “cables are the vines of the city”?

- A. to show why rats enjoy chewing on cables
- B. to show that vines are nutritious for rats
- C. to show that rats like living in vehicles
- D. to show why it is hard to find rats

4 What is one of the **main** purposes of the statistics in paragraph 3?

- A. to show how many rats live in city buildings
- B. to show how poorly constructed most cities are
- C. to emphasize the damage rats do to city infrastructure
- D. to emphasize the amount of litter people in cities produce

5 Which of the following additions to paragraph 4 would be **most** useful to the reader?

- A. a picture of a rat
- B. a picture of a trap
- C. a picture of a rat nest
- D. a picture of a subway tunnel

6 Read the examples from the excerpt in the box below.

- One spring, beneath the Brooklyn Bridge, I saw a red-haired brown rat that had been run over by a car.
- . . . people . . . throw the food that they have not eaten onto the tracks, along with newspapers and soda bottles and, I have noticed, thousands of no-longer-charged AA batteries, waiting to leak acid.

What do the examples show about the author’s research methods?

- A. The author relies on data from published studies.
- B. The author looks for humorous stories about rats.
- C. The author gathers his own field observations.
- D. The author contrasts rats with other animals.

- 7 Which of the following would be the **best** subtitle for the excerpt?
- A. "The Disease Carrier"
 - B. "Toward a Cleaner City"
 - C. "Life on the Train Tracks"
 - D. "Succeeding among Humans"

- 8 In paragraph 1, what does the information between the dashes provide?
- A. a transition
 - B. a definition
 - C. a personal belief
 - D. a familiar comparison

Question 9 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 9 in the space provided in your Student Answer Booklet.

- 9** Based on the excerpt, explain why brown rats have been able to thrive in urban areas. Support your answer with relevant and specific information from the excerpt.

Virgil's Georgics are a group of poems about rural life in ancient Rome. Read the excerpt from the Second Georgic and answer the questions that follow.

from the **Second Georgic**

Students read an excerpt from the “Second Georgic” and then answered questions 10 through 13 that follow on page 114 of this document.

Due to copyright restrictions, the excerpt cannot be released to the public over the Internet. For more information, see the copyright citation below.

Second Georgic by Virgil, translated by David Ferry, from *The Georgics of Virgil*. Copyright © 2005 by David Ferry. Reprinted by permission of Farrar, Straus and Giroux, LLC.

- 10 Based on the poem, which of the following **best** describes the poet's tone?
- A. regretful
 - B. admiring
 - C. sarcastic
 - D. proud
- 11 What is the **main** purpose of the examples given in lines 5–17?
- A. to emphasize the skill of Roman artists
 - B. to describe the lifestyle of the average Roman
 - C. to emphasize the farmers' jealousy of the rich
 - D. to describe the luxuries for which the farmers have no need
- 12 Based on lines 18–28, what is the **main** reason the speaker feels rural life is superior to other ways of life?
- A. The gods are frequent visitors.
 - B. Farmers' work is undemanding.
 - C. Nature's gifts promote serenity.
 - D. Farmers can make a lot of money.
- 13 What is the **main** purpose of the colon in line 20?
- A. to create a pause
 - B. to introduce a list
 - C. to link two sentences
 - D. to conclude a thought

In this essay, Judith Ortiz Cofer recalls how her childhood fantasies and her mother's dreams intersect. Read the essay "Volar," which means "to fly" in Spanish, and answer the questions that follow.

Volar

by Judith Ortiz Cofer

- 1 At twelve I was an avid consumer of comic books—*Supergirl* being my favorite. I spent my allowance of a quarter a day on two twelve-cent comic books or a double issue for twenty-five. I had a stack of *Legion of Super Heroes* and *Supergirl* comic books in my bedroom closet that was as tall as I. I had a recurring dream in those days: that I had long blond hair and could fly. In my dream I climbed the stairs to the top of our apartment building as myself, but as I went up each flight, changes would be taking place. Step by step I would fill out: my legs would grow long, my arms harden into steel, and my hair would magically go straight and turn a golden color. . . . Supergirl had to be aerodynamic. Sleek and hard as a supersonic missile. Once on the roof, my parents safely asleep in their beds, I would get on tip-toe, arms outstretched in the position for flight and jump out my fifty-story-high window into the black lake of the sky. From up there, over the rooftops, I could see everything, even beyond the few blocks of our barrio;¹ with my X-ray vision I could look inside the homes of people who interested me. Once I saw our landlord, whom I knew my parents feared, sitting in a treasure-room dressed in an ermine coat and a large gold crown. He sat on the floor counting his dollar bills. I played a trick on him. Going up to his building's chimney, I blew a little puff of my super-breath into his fireplace, scattering his stacks of money so that he had to start counting all over again. I could more or less program my Supergirl dreams in those days by focusing on the object of my current obsession. This way I "saw" into the private lives of my neighbors, my teachers, and in the last days of my childish fantasy and the beginning of adolescence, into the secret room of the boys I liked. In the mornings I'd wake up in my tiny bedroom with the incongruous—at least in our tiny apartment—white "princess" furniture my mother had chosen for me, and find myself back in my body: my tight curls still clinging to my head, skinny arms and legs . . . unchanged.
- 2 In the kitchen my mother and father would be talking softly over a café con leche.² She would come "wake me" exactly forty-five minutes after they had gotten up. It was their time together at the beginning of each day and even at an early age I could feel their disappointment if I interrupted them by getting up too early. So I would stay in my bed recalling my dreams of flight, perhaps planning my next flight. In the kitchen they would be discussing events in the barrio. Actually, he would be carrying that part of the conversation; when it was her turn to speak she would, more often than not, try shifting

¹ *barrio* — a Spanish-speaking neighborhood

² *café con leche* — coffee with milk

the topic toward her desire to see her *familia* on the Island: *How about a vacation in Puerto Rico together this year, Querido?*³ *We could rent a car, go to the beach. We could . . .* And he would answer patiently, gently, *Mi amor*;⁴ *do you know how much it would cost for the all of us to fly there? It is not possible for me to take the time off . . . Mi vida*,⁵ *please understand. . . .* And I knew that soon she would rise from the table. Not abruptly. She would light a cigarette and look out the kitchen window. The view was of a dismal alley that was littered with refuse thrown from windows. The space was too narrow for anyone larger than a skinny child to enter safely, so it was never cleaned. My mother would check the time on the clock over her sink, the one with a prayer for patience and grace written in Spanish. A birthday gift. She would see that it was time to wake me. She'd sigh deeply and say the same thing the view from her kitchen window always inspired her to say: *Ay, si yo pudiera volar*.⁶

³ *Querido* — dear

⁴ *Mi amor* — my love

⁵ *Mi vida* — my life, used as a term of endearment

⁶ *Ay, si yo pudiera volar* — Oh, if only I could fly

“Volar” by Judith Ortiz Cofer, translated by Elena Olazagasti-Segovia, from *El año de nuestra revolución*. Copyright © 2006 by Arte Público Press—University of Houston. Reprinted by permission of Arte Público Press—University of Houston.

- 14 In paragraph 1, which specific action changes the author from a girl into a superhero?

A. turning a page in one of her comic books

B. looking out over the houses in her neighborhood

C. climbing the stairs to the top of her apartment building

D. playing a trick on the landlord of her apartment building

- 15 Read the sentence from paragraph 1 in the box below.

. . . I would get on tip-toe, arms outstretched in the position for flight and jump out my fifty-story-high window into the black lake of the sky.

In the sentence, the phrase “black lake of the sky” makes the sky seem

A. playful.

B. relaxing.

C. polluted.

D. boundless.

- 16 Based on the essay, which characteristic **best** describes the author’s father?

A. ambitious

B. practical

C. content

D. harsh

- 17 What is the **main** effect of the author’s use of Spanish phrases in the essay?

A. It captures the author’s cultural environment.

B. It identifies the intended audience for the essay.

C. It emphasizes the tension between the author’s parents.

D. It indicates the time period in which the essay takes place.

Question 18 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 18 in the space provided in your Student Answer Booklet.

- 18** Based on the essay, compare the dreams of the author and her mother. Support your answer with relevant and specific details from the essay.

English Language Arts

READING COMPREHENSION: SESSION 2

DIRECTIONS

This session contains one reading selection with eight multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

In this excerpt from the novel Bridge of Sighs, the narrator reminisces about “surfing” in the back of his father’s milk delivery truck with his friend, Bobby Marconi. Read the excerpt and answer the questions that follow.

from **Bridge of Sighs**
by Richard Russo

- 1 There were no milk deliveries to residences on Saturdays, just to commercial businesses, and there were relatively few of these in the Borough. My father would finish his deliveries early, then swing by the house for Bobby Marconi and me so we could “surf the truck.” The empty metal milk crates were by then stacked and roped off against the side panels to prevent them from sliding and bouncing around when he turned corners. His careful stacking left most of the back empty, and Bobby and I would stand in the space created, our feet planted firmly on the ribbed floor, and pretend to surf, our arms out at our sides to keep our balance as the truck rattled along the wide Borough streets. I always surfed in the forward position, an advantage because you could see the turns coming. Bobby, as athletic in the milk truck as he was elsewhere, surfed more or less blind behind me. Not being able to see what was coming made the game that much more fun, he claimed, though I did help him by calling out “Left!” or “Sharp right!” when a turn approached. The idea was to make it through these turns without grabbing the empty milk crates for balance or the rail that ran the length of the truck, my father chortling appreciatively up front in the driver’s seat as we crashed about.
- 2 Of course my father wasn’t supposed to take Bobby and me on his route, but the rules were lax and people did it all the time, was his thinking. There was no passenger seat, since there weren’t supposed to be any passengers, so if my father braked hard, there was nothing to stop Bobby and me but the metal dash. My father would try to grab us as we flew by, and he was good at it, but you never knew what his big fist would grab hold of—an arm, your hair—and being saved from hitting the console sometimes hurt worse than colliding with it.
- 3 “No, you ain’t gonna do no surfing today,” he’d tell us first thing each Saturday. “Bobby’s dad don’t want him doing that no more.” Mr. Marconi had made that pretty clear early on. Bobby had come home with a knot on his forehead, and his father had wanted to know why, so he’d explained how we always surfed the milk truck. It was fun, he said, and not really dangerous because my father never went fast. Which was true—you *couldn’t* go fast in a milk truck if you tried.
- 4 But the next Saturday, when we pulled up in the truck, Mr. Marconi came out, too, and took my father aside. “Tell me about this surfing,” he demanded, leaning toward him aggressively, his birthmark a bright purple. Lately, things had gotten a little easier between them, so much so that my father had remarked on it, even speculating that his neighbor had decided to bury the hatchet.
- 5 My father explained to him how devoted we were to our surfing on Saturday mornings, how we looked forward to it all week, how Mr. Marconi should hear how we laughed and

shouted there in the back of the truck, how we hated it when he finally said that was enough. He said he was sorry about Bobby getting that lump on his noggin last week. “He don’t like to grab on till the last second,” he explained, which was true. It was Bobby’s fearlessness, his refusal to grab on to the rail or the stacked crates to keep from going flying, that had caused the injury. “Don’t worry,” my father assured him. “I keep a pretty good eye on ’em.”

6 “You better had,” Mr. Marconi said. “Anything happens to my boy in that truck, you’re responsible.”

7 So the following Saturday, the new rule was No Surfing the Truck, but that made us miserable. There was no reason to be *in* the truck if we weren’t allowed to surf. “Just a *little*,” we pleaded. “Just five minutes? Just around this one corner? Pleeeeease?” And so it was that we wore my father down. Over time we went from No Surfing to No Surfing Till We’re Headed Back Home, thus limiting the amount of time for an injury to occur, to Be Careful, You Two, Because Bobby’s Dad Will Skin Me Alive If He Gets Hurt, and If He Don’t Your Mother Will, because, truth be told, she didn’t like the idea either.

8 Why so much worry about us getting hurt? Well, because that’s what invariably happened. Otherwise, how would we know the game was over? Of course our injuries were not serious—a jammed finger, a skinned knee, usually—and most Saturdays we surfed until I cried, because Bobby, when he was injured, refused to cry, so my father didn’t know he’d been hurt and the fun could continue. I deeply envied Bobby his self-control and tried my best to emulate him, even as I suspected I’d never master the trick. Why he never cried was an even deeper mystery to me than why he never had to pay the bridge toll back when we lived on Berman Court. Every Saturday I’d tell myself that I wasn’t going to cry, but when the time came and I went crashing into the side of the truck, and my father, hearing the impact, turned around in his seat to check on us, my resolution would dissolve, not so much because of the pain as from his expression, which suggested that he knew I was hurt, that I couldn’t fool him anyway, so why try? And then the tears would just *be* there, brimming over, no holding them back.

9 Still, before long we’d forgotten all about Mr. Marconi’s solemn warning, and why not? He had to know we were back at it. One or the other of us always got off the milk truck limping or rubbing an elbow, but we were also in high spirits, laughing and shouting and trying to get my father to promise we’d do it again next Saturday. Which wasn’t hard work, since he enjoyed the whole thing about as much as we did. He never talked about his own childhood, but according to my mother it couldn’t really be called a childhood at all, just an unrelenting series of chores, from sunrise to sunset, bleak and unending, which was why, she explained, he wasn’t anxious for me to have a paper route like Bobby or to be overburdened with responsibilities around the house. I was to keep my room clean and study when I was supposed to, but otherwise I was simply to be the sort of boy my father never had a chance to be. The pleasure he took in our joy when we surfed his milk truck was purely vicarious, and his grin was ear to ear.

10 My own Saturday morning happiness was more complex. It’s true that I looked forward all week to our surfing. As I said, it was about the only time Bobby and I got to spend together. But as the summer wore on I became troubled by the knowledge that part of me was waiting for, indeed looking forward to, my friend getting hurt. It had, of course, nothing to do with him and everything to do with my own cowardice and jealousy. The jealous part had to do, I think, with my understanding that Bobby’s bravery meant he was having more fun, something

that my own cowardly bailing out had robbed me of. Each week I told myself I'd be braver, that this Saturday I wouldn't reach out and hold on for safety. I'd surrender control and be flung about, laughing and full of joyous abandon. But every outing was the same as the last, and when the moment came, I grabbed on. Gradually, since wishing for courage didn't work, I began wishing for something else entirely. I never wanted Bobby to be seriously injured, of course. That would have meant the end of everything. But I did wish that just once he'd be hurt bad enough to cry, which would lessen the gulf I perceived between him and me.

11 And so our milk-truck surfing ended the only way it could. I didn't actually see Bobby break his wrist when he was flung against the side of the truck. I heard the bone snap, though. What saved me from suffering the same fate was my cowardice. I'd seen the curve coming and at the last second reached out and grabbed one of the tied-off milk crates. Bobby, taken by surprise, went flying.

12 He must've known that his wrist was broken, because he went very pale, and when our eyes met and he saw my shock and fear, he immediately sat down with his back to the panel, cradling his hand in his lap against the truck's vibrations. I think what my father heard wasn't the terrible crack of Bobby's wrist but only the silence that followed, and he immediately called back to us, wanting to know if we were all right. When Bobby refused to speak, I said that we were, but he knew better. If we weren't whooping and hollering back there, something was wrong, and more seriously wrong than what happened every other Saturday morning. He didn't just pull over and climb back into the dark interior of the truck, but instead got out, came around and threw the big rear doors wide open so the light could pour in. After one look at the angle of Bobby's wrist, the blood drained out of my father's face. While I expected him to get mad, he didn't, and when he simply closed the doors again, got back into the truck and turned for home, it wasn't Bobby but me who began to cry.

13 Mr. Marconi was sitting on their upstairs front porch reading a magazine when we pulled up at the curb, and he seemed to know something had happened even before my father opened the rear doors of the truck. On the ride back from the Borough, Bobby had gotten sick, and the front of his shirt now glistened with vomit.

14 When Mr. Marconi emerged from the house, my father began "It was an acci—" but Mr. Marconi held up his index finger, as if to say *Wait a minute*, except that he kept holding it there between them, which altered the meaning of the gesture completely. My father seemed to understand that he was being told to hold his tongue and, for the moment, at least, he held it. Mr. Marconi then reached up into the truck, lifted Bobby down and helped him into the station wagon. "I—" my father began again, but Mr. Marconi again held up that index finger and waited until my father backed up onto the terrace, allowing him to go around to the driver's side and get in next to Bobby, who was by this time slumped against the door, having finally passed out from the pain.

15 I was remembering what he'd said to me a few minutes before as we sat together in the back of the truck, everything quiet now aside from the rattling of the milk crates. "You didn't call the turn." He seemed less angry than curious, but it was an accusation just the same. I didn't know what to say, though as soon as he spoke those words, I realized they were true.

- 19 What is the **main** purpose of paragraph 4?
- A. to highlight the setting of the story
 - B. to explain the resolution of a conflict
 - C. to reveal the motivation of a character
 - D. to illustrate the relationship between two characters

- 20 Based on paragraph 7, what happens as the rides in the truck continue?
- A. The rules become less rigid.
 - B. The different rules are compared.
 - C. The rules become clear to the narrator.
 - D. The mother of the narrator adds more rules.

- 21 Based on paragraph 8, what is the **main** reason the narrator is intrigued with Bobby's refusal to cry?
- A. He is worried about Bobby's attitude.
 - B. He does not possess Bobby's willpower.
 - C. He knows that Bobby has a difficult life.
 - D. He is not convinced that Bobby is sincere.

- 22 Based on paragraph 9, what is the **main** reason the narrator's father lets the boys surf the truck?
- A. The father wants to challenge authority.
 - B. The father believes his wife will not mind.
 - C. The father did not have an easy childhood.
 - D. The father did it himself when he was young.

- 23 What is the **main** purpose of paragraph 10?
- A. to explain a new character's views
 - B. to describe a situation the narrator fears
 - C. to provide an analysis of the narrator's thoughts
 - D. to highlight an opportunity presented to the characters
- 24 In paragraph 12, what does the description of the father's reaction emphasize?
- A. his frustration that his son is upset again
 - B. his realization that it is a serious situation
 - C. his anger that the deliveries will be affected
 - D. his impatience at the irresponsibility of the boys

- 25 What does paragraph 15 suggest about Bobby?
- A. He shares the narrator's guilt.
 - B. He senses the narrator's ill will.
 - C. He recognizes the narrator's skill.
 - D. He forgives the narrator's carelessness.
- 26 Read the sentence from paragraph 8 in the box below.

I deeply envied Bobby his self-control and tried my best to emulate him, even as I suspected I'd never master the trick.

Based on the sentence, what does the word *emulate* mean?

- A. teach
- B. avoid
- C. imitate
- D. distract

Question 27 is an open-response question.

- **Read the question carefully.**
- **Explain your answer.**
- **Add supporting details.**
- **Double-check your work.**

Write your answer to question 27 in the space provided in your Student Answer Booklet.

- 27** Based on the excerpt, explain how surfing the truck reveals the narrator's feelings about Bobby. Support your answer with relevant and specific information from the excerpt.

English Language Arts

READING COMPREHENSION: SESSION 3

DIRECTIONS

This session contains two reading selections with twelve multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

One of the great accomplishments in modern engineering is the 32-mile tunnel that runs from Britain to France. Read about the challenges the builders faced during the project and answer the questions that follow.

The Channel Tunnel

by Peter Ross

Students read a selection titled “The Channel Tunnel” and then answered questions 28 through 36 that follow on pages 129 through 131 of this document.

Due to copyright restrictions, the excerpt cannot be released to the public over the Internet. For more information, see the copyright citation below.

“The Channel Tunnel” by Peter Ross, from *The Seventy Wonders of the Modern World*. Text and illustrations copyright © 2002 by Thames & Hudson Ltd. Reprinted by permission of Thames & Hudson Ltd. Photograph copyright © David Sailors/Corbis.

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- 28 Based on paragraph 2, why did the British finally decide to build the tunnel?
- A. It would make Britain more popular.
 - B. It would benefit Britain economically.
 - C. It would make Britain stronger militarily.
 - D. It would encourage people to move to Britain.
- 29 What is the **main** focus of paragraph 3?
- A. the history of mountain tunnels
 - B. the reasons the tunnel was limited to trains
 - C. the advantages of traveling through tunnels
 - D. the problems the tunnel presents for drivers
- 30 Based on the selection, what did the use of accurate optical instruments and overhead satellites suggest about the tunnel project?
- A. It lacked the proper funding.
 - B. It was frustrating to organize.
 - C. It did not require a lot of manpower to complete.
 - D. It would not have been possible before modern technology.
- 31 Based on paragraph 8, how did the length of the tunnel pose potential problems during construction?
- A. It made it harder to finish the tunnel on time.
 - B. It made it harder for workers to breathe in the tunnel.
 - C. It made it more likely that the tunnel would collapse.
 - D. It made it more likely that the ends of the tunnel would not meet.

- 32 According to paragraph 10, what did the November 1996 fire reveal about the tunnel?
- A. Trains should be kept out of the tunnel.
 - B. The emergency functions were well designed.
 - C. People would be reluctant to use the tunnel again.
 - D. The metal on the train tracks was improperly made.

- 33 Based on the selection and the illustrations, the running tunnels are used for
- A. train travel.
 - B. releasing air.
 - C. pedestrian traffic.
 - D. evacuating people.

- 34 In the selection, why is the term “Chalk Marl” capitalized?
- A. It is the name of a famous city.
 - B. It is a recognized geologic feature.
 - C. It is an outdated term.
 - D. It is a foreign term.

- 35 Read the sentence from paragraph 8 in the box below.

The need for accurate control of the tunnelling operations was therefore paramount, . . .

- What is the meaning of *paramount* in the sentence?
- A. useful
 - B. successful
 - C. most technical
 - D. most important

Question 36 is an open-response question.

- Read the question carefully.
- Explain your answer.
- Add supporting details.
- Double-check your work.

Write your answer to question 36 in the space provided in your Student Answer Booklet.

- 36** Based on the selection, explain how the engineers of the Channel Tunnel project ensured the tunnel would be safe for workers and travelers. Support your answer with relevant and specific information from the selection.

In this excerpt from the famous Old English epic, Beowulf and his fellow Geats are visiting the Danes, who have been repeatedly attacked by the monster Grendel. With the exception of Unferth, the Danes welcome Beowulf as a hero who can help them defeat the monster. Read the excerpt from Seamus Heaney's translation of Beowulf and then answer the questions that follow.

from *Beowulf*

. . .

- From where he crouched at the king's feet,
 Unferth, a son of Ecglaf's, spoke
 contrary words. Beowulf's coming,
 his sea-braving, made him sick with envy:
- 5 he could not brook or abide the fact
 that anyone else alive under heaven
 might enjoy greater regard than he did:
 "Are you the Beowulf who took on Breca
 in a swimming match on the open sea,
- 10 risking the water just to prove that you could win?
 It was sheer vanity made you venture out
 on the main deep. And no matter who tried,
 friend or foe, to deflect the pair of you,
 neither would back down: the sea-test obsessed you.
- 15 You waded in, embracing water,
 taking its measure, mastering currents,
 riding on the swell. The ocean swayed,
 winter went wild in the waves, but you vied
 for seven nights; and then he outswam you,
- 20 came ashore the stronger contender.
 He was cast up safe and sound one morning
 among the Heathoreams, then made his way
 to where he belonged in Bronding country,
 home again, sure of his ground
- 25 in strongroom and bawn. So Breca made good
 his boast upon you and was proved right.
 No matter, therefore, how you may have fared
 in every bout and battle until now,
 this time you'll be worsted; no one has ever
- 30 outlasted an entire night against Grendel."

Beowulf, Ecgtheow's son, replied:
 "Well, friend Unferth, you have had your say
 about Breca and me. But it was mostly beer

that was doing the talking. The truth is this:
35 when the going was heavy in those high waves,
I was the strongest swimmer of all.
We'd been children together and we grew up
daring ourselves to outdo each other,
boasting and urging each other to risk
40 our lives on the sea. And so it turned out.
Each of us swam holding a sword,
a naked, hard-proofed blade for protection
against the whale-beasts. But Breca could never
move out farther or faster from me
45 than I could manage to move from him.
Shoulder to shoulder, we struggled on
for five nights, until the long flow
and pitch of the waves, the perishing cold,
night falling and winds from the north
50 drove us apart. The deep boiled up
and its wallowing sent the sea-brutes wild.
My armour helped me to hold out;
my hard-ringed chain-mail, hand-forged and linked,
a fine, close-fitting filigree of gold,
55 kept me safe when some ocean creature
pulled me to the bottom. Pinioned fast
and swathed in its grip, I was granted one
final chance: my sword plunged
and the ordeal was over. Through my own hands,
60 the fury of battle had finished off the sea-beast.

"Time and again, foul things attacked me,
lurking and stalking, but I lashed out,
gave as good as I got with my sword.
My flesh was not for feasting on,
65 there would be no monsters gnawing and gloating
over their banquet at the bottom of the sea.
Instead, in the morning, mangled and sleeping
the sleep of the sword, they slopped and floated
like the ocean's leavings. From now on
70 sailors would be safe, the deep-sea raids
were over for good. Light came from the east,
bright guarantee of God, and the waves
went quiet; I could see headlands
and buffeted cliffs. Often, for undaunted courage,
75 fate spares the man it has not already marked.

However it occurred, my sword had killed
 nine sea-monsters. Such night-dangers
 and hard ordeals I have never heard of
 nor of a man more desolate in surging waves.

80 But worn out as I was, I survived,
 came through with my life. The ocean lifted
 and laid me ashore, I landed safe
 on the coast of Finland.

Now I cannot recall

85 any fight you entered, Unferth,
 that bears comparison. I don't boast when I say
 that neither you nor Breca were ever much
 celebrated for swordsmanship
 or for facing danger on the field of battle.

90 You killed your own kith and kin,
 so for all your cleverness and quick tongue,
 you will suffer damnation in the depths of hell.
 The fact is, Unferth, if you were truly
 as keen or courageous as you claim to be

95 Grendel would never have got away with
 such unchecked atrocity, attacks on your king,
 havoc in Heorot and horrors everywhere.
 But he knows he need never be in dread
 of your blade making a mizzle* of his blood
 100 or of vengeance arriving ever from this quarter—
 from the Victory-Shieldings, the shoulderers of the spear.
 He knows he can trample down you Danes
 to his heart's content, humiliate and murder
 without fear of reprisal. But he will find me different.

105 I will show him how Geats shape to kill
 in the heat of battle. Then whoever wants to
 may go bravely to mead, when morning light,
 scarfed in sun-dazzle, shines forth from the south
 and brings another daybreak to the world."

. . .

—Translation by Seamus Heaney

* *mizzle* — a fine spray or mist

- 37 Based on lines 8–12, what does Unferth claim was the **main** reason Beowulf went out on the ocean?
- A. to save Breca
 - B. to battle Grendel
 - C. to kill the sea-beasts
 - D. to prove his superiority

- 38 Read lines 17 and 18 in the box below.

... The ocean swayed,
winter went wild in the waves, ...

What is the effect of the imagery in the lines?

- A. It shows the danger Beowulf faced.
- B. It shows the speed of the sea-beasts.
- C. It shows why Beowulf was defeated.
- D. It shows God’s anger at the swimmers.

- 39 In lines 67–68, to what does “sleeping / the sleep of the sword” refer?
- A. death
 - B. peace
 - C. honor
 - D. memory

- 40 In lines 74 and 75, what reason does Beowulf give for his survival?
- A. His skill scared the monsters away.
 - B. His bravery brought him special favor.
 - C. He had help from some sailors.
 - D. He found a piece of wood to float on.

Grade 10 English Language Arts
Reading Comprehension
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	109	<i>Reading and Literature</i>	13	D
2	109	<i>Reading and Literature</i>	13	B
3	110	<i>Reading and Literature</i>	15	A
4	110	<i>Reading and Literature</i>	13	C
5	110	<i>Reading and Literature</i>	10	C
6	110	<i>Reading and Literature</i>	13	C
7	111	<i>Reading and Literature</i>	10	D
8	111	<i>Language</i>	5	D
9	112	<i>Reading and Literature</i>	13	
10	114	<i>Reading and Literature</i>	15	B
11	114	<i>Reading and Literature</i>	14	D
12	114	<i>Reading and Literature</i>	14	C
13	114	<i>Language</i>	5	B
14	117	<i>Reading and Literature</i>	8	C
15	117	<i>Reading and Literature</i>	15	D
16	117	<i>Reading and Literature</i>	12	B
17	117	<i>Language</i>	6	A
18	118	<i>Reading and Literature</i>	12	
19	122	<i>Reading and Literature</i>	12	D
20	122	<i>Reading and Literature</i>	12	A
21	122	<i>Reading and Literature</i>	12	B
22	122	<i>Reading and Literature</i>	12	C
23	123	<i>Reading and Literature</i>	12	C
24	123	<i>Reading and Literature</i>	12	B
25	123	<i>Reading and Literature</i>	12	B
26	123	<i>Language</i>	4	C
27	124	<i>Reading and Literature</i>	12	
28	129	<i>Reading and Literature</i>	13	B
29	129	<i>Reading and Literature</i>	13	B
30	129	<i>Reading and Literature</i>	13	D
31	129	<i>Reading and Literature</i>	13	D
32	130	<i>Reading and Literature</i>	13	B
33	130	<i>Reading and Literature</i>	13	A
34	130	<i>Language</i>	5	B
35	130	<i>Language</i>	4	D
36	131	<i>Reading and Literature</i>	13	
37	135	<i>Reading and Literature</i>	16	D
38	135	<i>Reading and Literature</i>	15	A
39	135	<i>Reading and Literature</i>	15	A
40	135	<i>Reading and Literature</i>	8	B

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by the shaded cells, will be posted to the Department's website later this year.

IX. Mathematics, Grade 3

Grade 3 Mathematics Test

The spring 2012 grade 3 Mathematics test was based on learning standards in the five major content strands of the Massachusetts *Mathematics Curriculum Framework* (2000) listed below. Specific learning standards for grade 3 are found in the *Supplement to the Massachusetts Mathematics Curriculum Framework* (2004). Page numbers for the grades 3–4 *Framework* learning standards and for the grade 3 *Supplement* standards appear in parentheses.

- Number Sense and Operations (*Framework*, pages 22–23; *Supplement*, pages 3–4)
- Patterns, Relations, and Algebra (*Framework*, page 32; *Supplement*, page 4)
- Geometry (*Framework*, page 40; *Supplement*, pages 4–5)
- Measurement (*Framework*, page 48; *Supplement*, page 5)
- Data Analysis, Statistics, and Probability (*Framework*, page 56; *Supplement*, pages 5–6)

The *Mathematics Curriculum Framework* and *Supplement* are available on the Department website at www.doe.mass.edu/frameworks/current.html.

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework content strands listed above.

Test Sessions

The grade 3 Mathematics test included two separate test sessions. Each session included multiple-choice, short-answer, and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in grade 3 test & answer booklets.

Reference Materials and Tools

Each student taking the grade 3 Mathematics test was provided with a plastic ruler and a grade 3 Mathematics Tool Kit. A copy of the tool kit pieces used by students to answer question 17 immediately follows the last question in this chapter. An image of the ruler is not reproduced in this publication.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Mathematics test sessions. No calculators, other reference tools, or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the released item table.

Mathematics

SESSION 1

You may use your tool kit and MCAS ruler during this session.

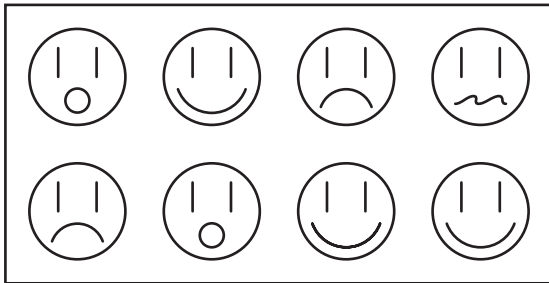
You may **not** use a calculator during this session.




DIRECTIONS

This session contains six multiple-choice questions, two short-answer questions, and two open-response questions. For multiple-choice questions, mark your answers by filling in the circle next to the best answer. For the short-answer and open-response questions, write your answer in the space provided below the question.

- 1 Jeremy drew the faces shown in the box below.



What fraction of the faces are ?

- (A) $\frac{1}{3}$
- (B) $\frac{3}{8}$
- (C) $\frac{3}{5}$
- (D) $\frac{8}{3}$

- 2 Ms. Pack wrote the number sentence shown below.

$$5 + 9 + 5 = \square$$

Which of these number sentences is equal to Ms. Pack's number sentence?

- (A) $5 + 9 + 9 = \square$
- (B) $5 + 9 + 0 = \square$
- (C) $10 + 9 = \square$
- (D) $13 + 5 = \square$

Question 3 is a short-answer question. Write your answer to this question in the Answer Box provided.

- 3 What number belongs in the $\boxed{?}$ below to make the number sentence true?

$$90 \times \boxed{?} = 630$$

Write your answer in the Answer Box below.

Answer Box

3

Mark your choice for multiple-choice question 4 by filling in the circle next to the best answer.

- 4 Oliver made the pattern shown below with his number cards.

16	22	28	34	40
----	----	----	----	----

Start

Which of these could be the rule for Oliver's pattern?

- | | |
|---|------------|
| Ⓐ | add 5 |
| Ⓑ | add 6 |
| Ⓒ | subtract 5 |
| Ⓓ | subtract 6 |

Write your answers to parts (a) and (b) of open-response question 5 in the spaces provided.

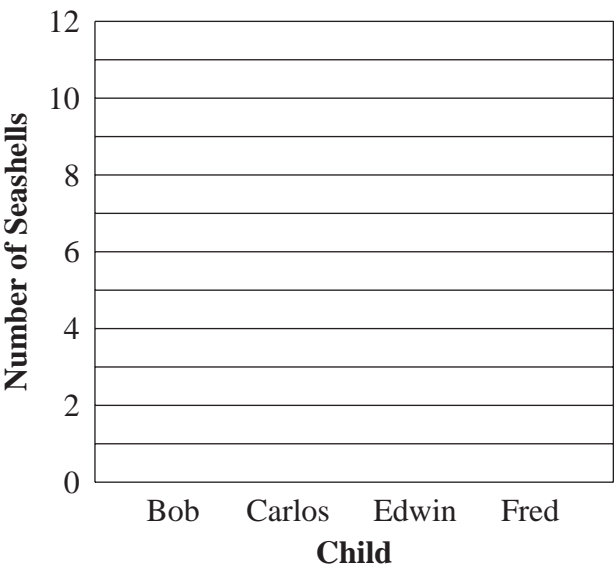
- 5 The table below shows the numbers of seashells that four children found at the beach.

Seashells Found

Child	Number of Seashells
Bob	9
Carlos	9
Edwin	5
Fred	10

- a. Complete the bar graph below by drawing bars to show the number of seashells each child found.

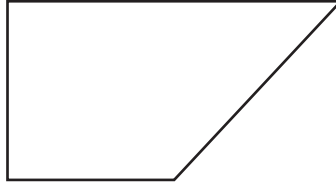
Seashells Found



- b. Use the data from your bar graph to write a sentence that compares the numbers of seashells the children found.

Question 6 is a short-answer question. Write your answer to this question in the Answer Box provided.

- 6 Eva drew the shape shown below.



How many right angles does Eva's shape seem to have? Write your answer in the Answer Box below.

Answer Box

6

Mark your choices for multiple-choice questions 7 through 9 by filling in the circle next to the best answer.

- 7 The chart below shows the number of pounds of newspaper that were collected by students in each grade at Jefferson School.

Newspaper Collected	
Grade	Pounds
3	87
4	109
5	145

How many pounds of newspaper did these students collect altogether?

- (A)

221
- (B)

241
- (C)

321
- (D)

341

- 8 Which of these rectangles has a perimeter of 12 feet?

(A)

4 feet

2 feet

(B)

4 feet

3 feet

(C)

6 feet

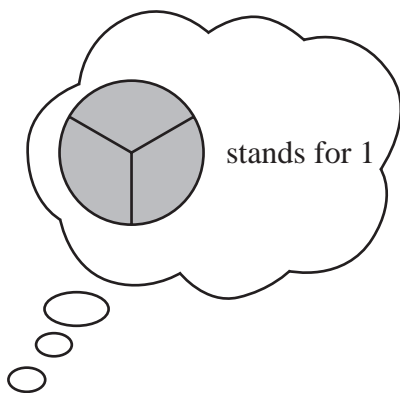
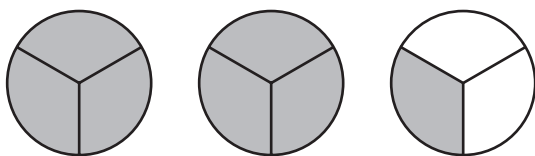
2 feet

(D)

8 feet

4 feet

- 9 Jasmine shaded the circles below to show a mixed number.

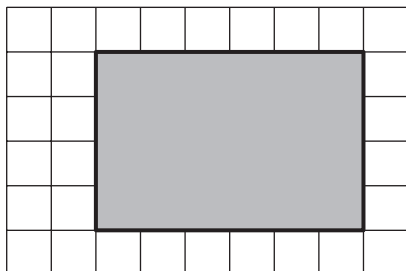


What mixed number is shown by Jasmine's circles?

- (A) $2\frac{1}{3}$
- (B) $2\frac{1}{2}$
- (C) $6\frac{1}{3}$
- (D) $6\frac{1}{2}$

Write your answers to parts (a) and (b) of open-response question 10 in the spaces provided.

- 10 Jaya drew a shaded rectangle on a grid, as shown below.



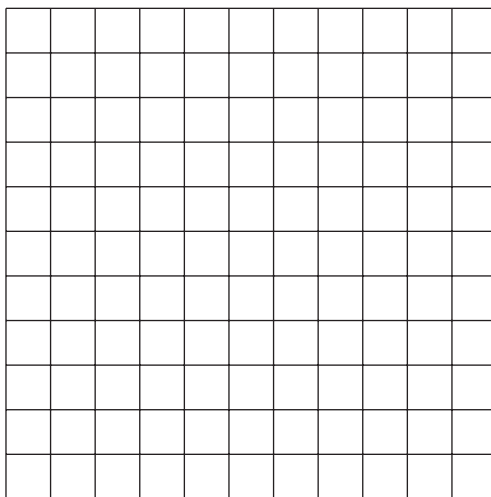
stands for 1 square unit

- a. What is the area, in square units, of Jaya's shaded rectangle? _____ Show or explain how you got your answer.

- b. Marc also drew a rectangle.

- Marc's rectangle has the same area as Jaya's rectangle.
- Marc's rectangle has a width of 3 units.

What is the length, in units, of Marc's rectangle? _____ On the grid below, draw Marc's rectangle.



Mathematics

SESSION 2

*You may use your tool kit and MCAS ruler during this session.
You may **not** use a calculator during this session.*



DIRECTIONS

This session contains seven multiple-choice questions and one short-answer question. For multiple-choice questions, mark your answers by filling in the circle next to the best answer. For the short-answer question, write your answer in the space provided below the question.

- 11 What number belongs in the below to make the number sentence true?

$$\boxed{?} \times 4 = 36$$










- ☐ A 6
- ☐ B 7
- ☐ C 8
- ☐ D 9


- 12 Which of these is another way to write 9003?

- ☐ A nine hundred three
- ☐ B nine hundred thirty
- ☐ C nine thousand three
- ☐ D nine thousand thirty

- 13 The pictograph below shows how many pounds of metal, glass, and paper the Earth Club collected to recycle this week.

Earth Club Recycling

Material	Number of Pounds Collected
metal	  
glass	    
paper	

Key
 stands for 6 pounds

How many more pounds of glass than pounds of paper were collected?

- Ⓐ

Ⓑ

Ⓒ

Ⓓ

4

12

24

36

Question 14 is a short-answer question. Write your answer to this question in the Answer Box provided.

14 Compute:

$$\begin{array}{r} 503 \\ - 75 \\ \hline \end{array}$$

Write your answer in the Answer Box below.

Answer Box

14

Mark your choices for multiple-choice questions 15 through 18 by filling in the circle next to the best answer.

- 15 Katerina had 7 guests at her birthday party. She gave each guest 8 stickers. Which number sentence can be used to find how many stickers Katerina gave to her guests in all?

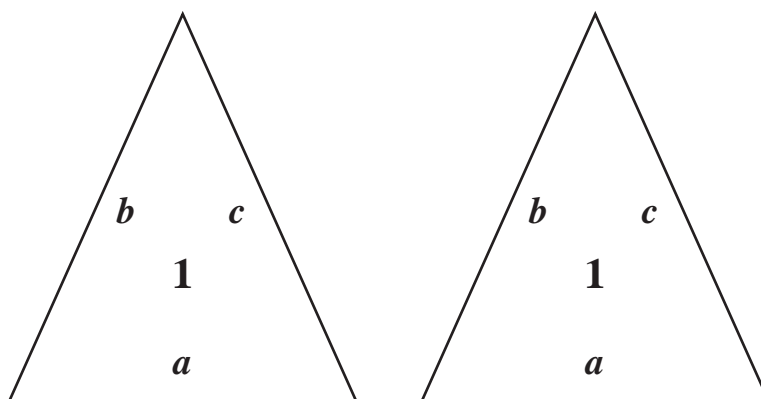
- Ⓐ $\square = 7 + 8$
- Ⓑ $\square = 7 \times 8$
- Ⓒ $\square + 7 = 8$
- Ⓓ $\square \times 7 = 8$

- 16 Joanie had \$14. Then she got \$23 for her birthday. Later she spent \$5 on a book. Which number sentence can be used to find m , the amount of money Joanie has now?

- Ⓐ $14 + 23 - 5 = m$
- Ⓑ $14 + 23 + 5 = m$
- Ⓒ $23 - 14 + 5 = m$
- Ⓓ $23 - 14 - 5 = m$

Use the two triangles labeled 1 from your tool kit to answer question 17.

- 17 Corey put together the two triangles shown below to make a new shape.



The rules he used to make his new shape are in the box below.

- The sides labeled a are next to each other.
- The triangles should touch but not overlap.

What new shape did Corey make?

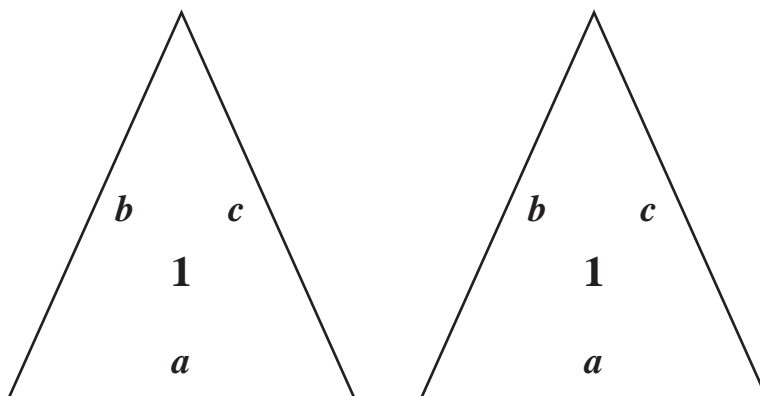
- Ⓐ a square
- Ⓑ a triangle
- Ⓒ a rhombus
- Ⓓ a rectangle

- 18 Raul, Sam, and Wanda each had a bag of popcorn. All the bags of popcorn were the same size.

- Raul ate $\frac{2}{2}$ of his popcorn.
- Sam ate $\frac{2}{3}$ of her popcorn.
- Wanda ate $\frac{3}{3}$ of her popcorn.

Which of these sentences is true?

- Ⓐ Raul ate less than Sam.
- Ⓑ Wanda ate more than Raul.
- Ⓒ Raul ate the same amount as Sam.
- Ⓓ Wanda ate the same amount as Raul.



Grade 3 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	137	<i>Number Sense and Operations</i>	3.N.3	B
2	137	<i>Number Sense and Operations</i>	3.N.7	C
3	138	<i>Patterns, Relations, and Algebra</i>	3.P.3	7
4	139	<i>Patterns, Relations, and Algebra</i>	3.P.1	B
5	140	<i>Data Analysis, Statistics, and Probability</i>	3.D.3	
6	141	<i>Geometry</i>	3.G.3	2
7	142	<i>Number Sense and Operations</i>	3.N.8	D
8	142	<i>Measurement</i>	3.M.4	A
9	143	<i>Number Sense and Operations</i>	3.N.3	A
10	144	<i>Measurement</i>	3.M.4	
11	145	<i>Patterns, Relations, and Algebra</i>	3.P.3	D
12	145	<i>Number Sense and Operations</i>	3.N.2	C
13	146	<i>Data Analysis, Statistics, and Probability</i>	3.D.3	C
14	147	<i>Number Sense and Operations</i>	3.N.10	428
15	148	<i>Number Sense and Operations</i>	3.N.6	B
16	148	<i>Patterns, Relations, and Algebra</i>	3.P.4	A
17	149	<i>Geometry</i>	3.G.7	C
18	150	<i>Number Sense and Operations</i>	3.N.4	D

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

Grade 3 Mathematics
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
19	<i>Data Analysis, Statistics, and Probability</i>	3.D.2
20	<i>Geometry</i>	3.G.1
21	<i>Number Sense and Operations</i>	3.N.6
22	<i>Number Sense and Operations</i>	3.N.11
23	<i>Data Analysis, Statistics, and Probability</i>	3.D.3
24	<i>Geometry</i>	3.G.2
25	<i>Measurement</i>	3.M.1
26	<i>Number Sense and Operations</i>	3.N.9
27	<i>Patterns, Relations, and Algebra</i>	3.P.1
28	<i>Number Sense and Operations</i>	3.N.4
29	<i>Number Sense and Operations</i>	3.N.8
30	<i>Data Analysis, Statistics, and Probability</i>	3.D.3
31	<i>Number Sense and Operations</i>	3.N.8
32	<i>Measurement</i>	3.M.5
33	<i>Measurement</i>	3.M.3
34	<i>Patterns, Relations, and Algebra</i>	3.P.4
35	<i>Number Sense and Operations</i>	3.N.12
36	<i>Patterns, Relations, and Algebra</i>	3.P.4

X. Mathematics, Grade 4

Grade 4 Mathematics Test

The spring 2012 grade 4 Mathematics test was based on learning standards in the five major content strands of the Massachusetts *Mathematics Curriculum Framework* (2000) listed below. Page numbers for the grades 3–4 *Framework* learning standards appear in parentheses.

- Number Sense and Operations (*Framework*, pages 22–23)
- Patterns, Relations, and Algebra (*Framework*, page 32)
- Geometry (*Framework*, page 40)
- Measurement (*Framework*, page 48)
- Data Analysis, Statistics, and Probability (*Framework*, page 56)

The *Mathematics Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework content strands listed above.

Test Sessions

The grade 4 Mathematics test included two separate test sessions. Each session included multiple-choice, short-answer, and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

Each student taking the grade 4 Mathematics test was provided with a plastic ruler and a grade 4 Mathematics Tool Kit. The tool kit pieces and an image of the ruler are not reproduced in this publication.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Mathematics test sessions. No calculators, other reference tools, or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the released item table.

Mathematics

SESSION 1

You may use your tool kit and MCAS ruler during this session.

You may **not** use a calculator during this session.

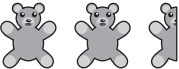


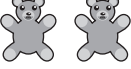



DIRECTIONS

This session contains nine multiple-choice questions, two short-answer questions, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 The graph below shows the number of stuffed animals each child has on her bed.

Stuffed Animals on Bed

Child	Number of Stuffed Animals
Meme	
Amy	
Sasha	
Chloe	

Key
 represents 6 animals

How many stuffed animals does Amy have on her bed?

- A. 2
- B. 6
- C. 9
- D. 12

- 2 Shawn rakes lawns to earn money. He always charges the same amount of money per hour. Shawn recorded the amount of time he spent raking and the money he earned in the table shown below.

Shawn's Record

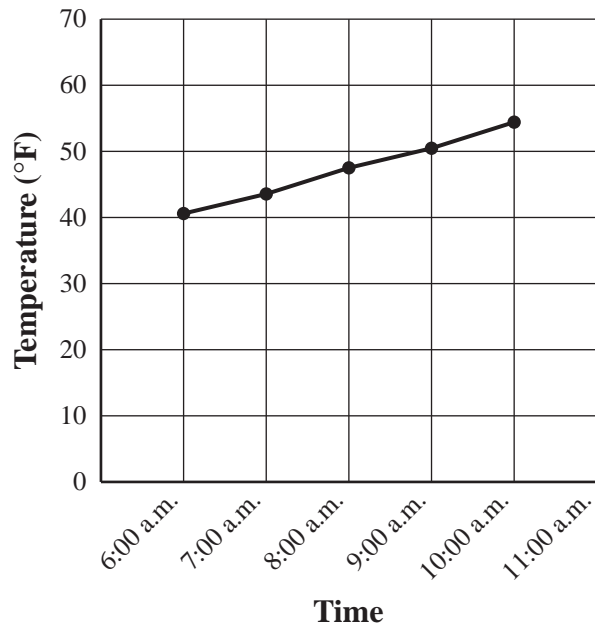
Time (in hours)	Money Earned
2	\$ 8
3	\$12
7	\$28
8	\$32
10	?

Shawn spent 10 hours raking a lawn. How much money did he earn raking the lawn?

- A. \$16
- B. \$34
- C. \$36
- D. \$40

- 3 The graph below shows the temperatures at Keung's house from 6:00 a.m. to 10:00 a.m.

Temperatures at Keung's House



Based on the graph, what will the temperature at Keung's house **most likely** be at 11:00 a.m.?

- A. 48°F
- B. 52°F
- C. 58°F
- D. 65°F

- 4 The table below shows the numbers of pieces of fruit in Larry's basket on Tuesday and Friday.

Fruit in Basket

Kind of Fruit	Number of Pieces on Tuesday	Number of Pieces on Friday
mango	5	4
banana	3	1
apple	4	2
orange	2	2

No one added any fruit to the basket. Larry ate some fruit from the basket between Tuesday and Friday.

How many pieces of fruit did Larry eat from the basket between Tuesday and Friday?

- A. 5
- B. 9
- C. 14
- D. 23

Questions 5 and 6 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 5 How many lines of symmetry does the letter below have?



- 6 What value of q makes the number sentence below true?

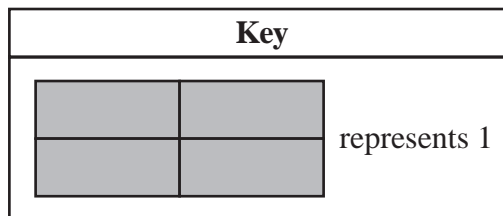
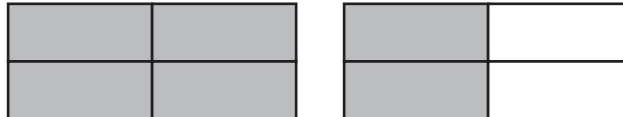
$$3 \times q = 165$$

Question 7 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 7 in the space provided in your Student Answer Booklet.

- 7** Chet shaded part of the two large rectangles shown below.



- Write a fraction that represents the shaded part of the two large rectangles.
- Write a different number that is equivalent to the fraction you wrote in part (a). Show or explain how you got your answer.
- In your Student Answer Booklet, draw and shade a picture of rectangles that represents the number $2\frac{1}{3}$. Show or explain how you got your answer.

Mark your answers to multiple-choice questions 8 through 12 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 8 Mr. Barker divided his garden into 6 equal parts, as shown below.

Mr. Barker's Garden

corn	corn	corn
lettuce	tomatoes	tomatoes

Which of the following represents the difference between the fraction of the garden Mr. Barker planted with corn and the fraction of the garden he planted with lettuce?

- A. $\frac{1}{6}$
B. $\frac{2}{6}$
C. $\frac{3}{6}$
D. $\frac{4}{6}$

- 9 Which of the following values for b makes the number sentence below true?

$$12 < 3 \times b$$

- A. 2
B. 3
C. 4
D. 5

- 10 Caroline is thinking of a number. Some clues for her number are listed in the box below.

The number has:

- 2 hundreds
- 6 ten thousands
- 4 ones

Which of the following could be Caroline's number?

- A. 200,604
- B. 60,204
- C. 6,204
- D. 264

- 11 How many diagonals does a square have?

- A. 1
- B. 2
- C. 3
- D. 4

- 12 Ms. Ewing asked her students to write a multiplication sentence that uses only multiples of 2. Which of the following uses only multiples of 2?

- A. $3 \times 6 = 18$
- B. $4 \times 6 = 24$
- C. $4 \times 7 = 28$
- D. $5 \times 7 = 35$

Mathematics

SESSION 2

You may use your tool kit and MCAS ruler during this session.

You may **not** use a calculator during this session.



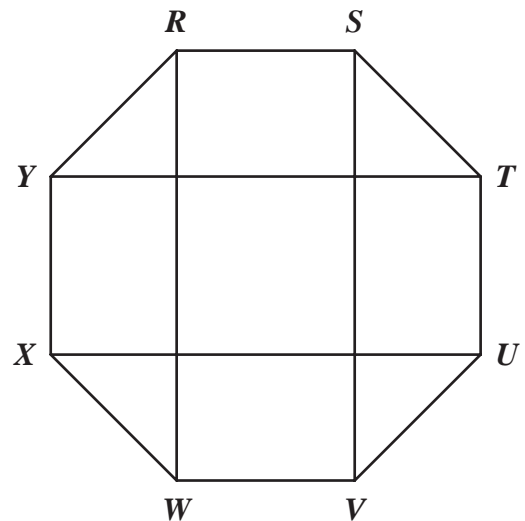
DIRECTIONS

This session contains seven multiple-choice questions, one short-answer question, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 13 What is 48,803 rounded to the nearest 10,000?

A. 40,000
B. 48,000
C. 49,000
D. 50,000

- 14 A regular octagon is shown below.



Which of the following line segments in the octagon are **perpendicular**?

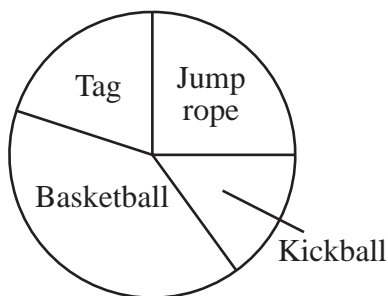
- A. \overline{SV} and \overline{XU}
B. \overline{SV} and \overline{ST}
C. \overline{YT} and \overline{ST}
D. \overline{YT} and \overline{XU}

- 15 The 20 students in a class wrote the names of their favorite recess activities on cards, as shown below.

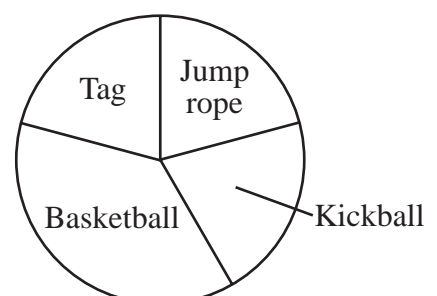
Kickball	Jump rope	Tag	Basketball	Jump rope
Kickball	Basketball	Basketball	Jump rope	Tag
Basketball	Jump rope	Basketball	Basketball	Kickball
Tag	Tag	Jump rope	Basketball	Basketball

Which circle graph best represents the favorite recess activities of the students?

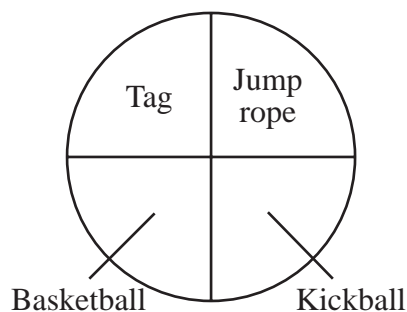
A. Favorite Recess Activities



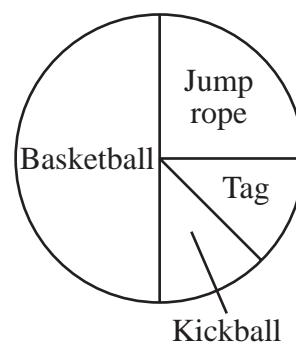
C. Favorite Recess Activities



B. Favorite Recess Activities



D. Favorite Recess Activities



- 16 The table below shows the numbers of people in different age groups in Boston in the year 2000.

Ages of People in Boston

Age Group (in years)	Number of People
under 5	32,046
5 to 9	33,721
10 to 14	32,553
15 to 19	43,631

Which age group in the table has fewer than 33,500 people but more than 32,500 people?

- A. under 5
- B. 5 to 9
- C. 10 to 14
- D. 15 to 19

- 17 Which of the following shows 70,329 written in expanded notation?

- A. $7 + 0 + 3 + 2 + 9$
- B. $70 + 3 + 2 + 9$
- C. $7,000 + 300 + 20 + 9$
- D. $70,000 + 300 + 20 + 9$

Question 18 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

18 Compute:

$$65 \times 98$$

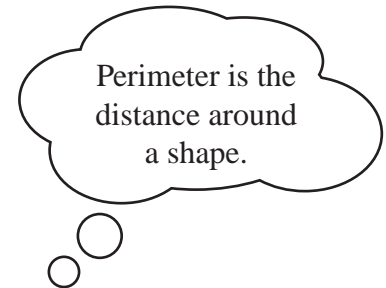
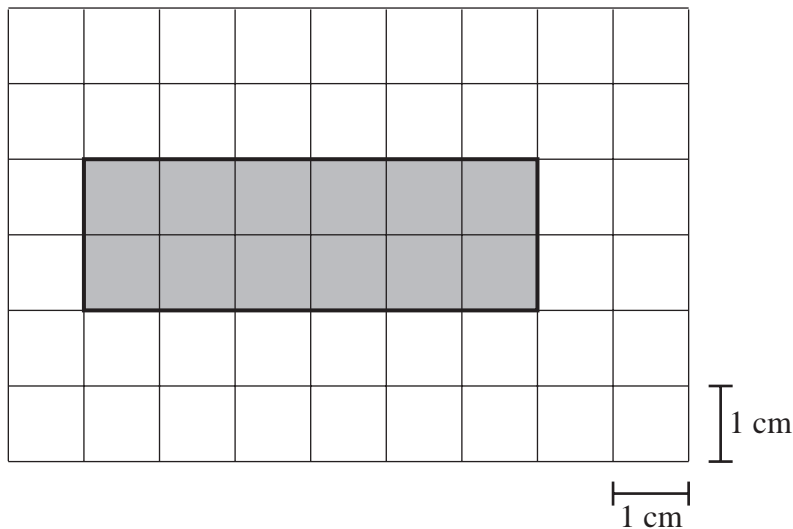
Question 19 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 19 in the space provided in your Student Answer Booklet.

You may use your MCAS ruler to answer question 19.

- 19** Marty drew a rectangle on a grid. He shaded the rectangle, as shown below.

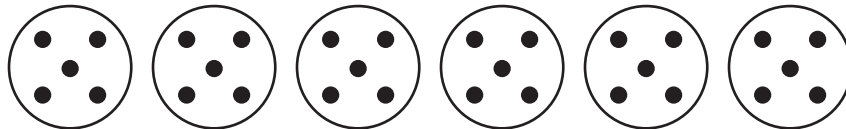


- What is the perimeter, in centimeters, of Marty's rectangle? Show or explain how you got your answer.
- What is the area, in square centimeters, of Marty's rectangle? Show or explain how you got your answer.
- In your Student Answer Booklet, draw a rectangle that has the **same perimeter** as Marty's rectangle but a **different area**. Use numbers to label the length and the width of your rectangle.
- What is the area, in square centimeters, of the rectangle you drew in part (c)? Show or explain how you got your answer.

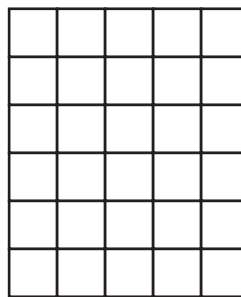
Mark your answers to multiple-choice questions 20 and 21 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 20 Elana made the two models shown below. Each model represents the same math problem.

Model 1



Model 2



Which of the following could be Elana's math problem?

- A. $6 + 5 = \square$
- B. $6 - 5 = \square$
- C. $6 \div 5 = \square$
- D. $6 \times 5 = \square$

21 Which of the following could have a face in the shape of a triangle?

- A. cone
- B. prism
- C. sphere
- D. cylinder

During testing, students were provided with tool kit pieces to answer test items that are not released.

Grade 4 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	158	<i>Data Analysis, Statistics, and Probability</i>	4.D.3	C
2	158	<i>Patterns, Relations, and Algebra</i>	4.P.1	D
3	159	<i>Data Analysis, Statistics, and Probability</i>	4.D.3	C
4	160	<i>Data Analysis, Statistics, and Probability</i>	4.D.3	A
5	161	<i>Geometry</i>	4.G.8	1
6	161	<i>Patterns, Relations, and Algebra</i>	4.P.3	55
7	162	<i>Number Sense and Operations</i>	4.N.4	
8	163	<i>Number Sense and Operations</i>	4.N.18	B
9	163	<i>Patterns, Relations, and Algebra</i>	4.P.2	D
10	164	<i>Number Sense and Operations</i>	4.N.1	B
11	164	<i>Geometry</i>	4.G.1	B
12	164	<i>Number Sense and Operations</i>	4.N.7	B
13	165	<i>Number Sense and Operations</i>	4.N.16	D
14	165	<i>Geometry</i>	4.G.5	A
15	166	<i>Data Analysis, Statistics, and Probability</i>	4.D.2	A
16	167	<i>Data Analysis, Statistics, and Probability</i>	4.D.3	C
17	167	<i>Number Sense and Operations</i>	4.N.2	D
18	168	<i>Number Sense and Operations</i>	4.N.12	6370
19	169	<i>Measurement</i>	4.M.4	
20	170	<i>Number Sense and Operations</i>	4.N.8	D
21	171	<i>Geometry</i>	4.G.1	B

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

Grade 4 Mathematics
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Number Sense and Operations</i>	4.N.11
23	<i>Number Sense and Operations</i>	4.N.4
24	<i>Measurement</i>	4.M.3
25	<i>Data Analysis, Statistics, and Probability</i>	4.D.3
26	<i>Number Sense and Operations</i>	4.N.5
27	<i>Measurement</i>	4.M.4
28	<i>Measurement</i>	4.M.5
29	<i>Number Sense and Operations</i>	4.N.10
30	<i>Patterns, Relations, and Algebra</i>	4.P.4
31	<i>Number Sense and Operations</i>	4.N.4
32	<i>Number Sense and Operations</i>	4.N.3
33	<i>Number Sense and Operations</i>	4.N.17
34	<i>Number Sense and Operations</i>	4.N.5
35	<i>Number Sense and Operations</i>	4.N.13
36	<i>Number Sense and Operations</i>	4.N.7
37	<i>Patterns, Relations, and Algebra</i>	4.P.4
38	<i>Data Analysis, Statistics, and Probability</i>	4.D.3
39	<i>Number Sense and Operations</i>	4.N.6
40	<i>Measurement</i>	4.M.2
41	<i>Data Analysis, Statistics, and Probability</i>	4.D.3
42	<i>Geometry</i>	4.G.1

XI. Mathematics, Grade 5

Grade 5 Mathematics Test

The spring 2012 grade 5 Mathematics test was based on learning standards in the five major content strands of the Massachusetts *Mathematics Curriculum Framework* (2000) listed below. Specific learning standards for grade 5 are found in the *Supplement to the Massachusetts Mathematics Curriculum Framework* (2004). Page numbers for the grades 5–6 *Framework* learning standards and for the grade 5 *Supplement* standards appear in parentheses.

- Number Sense and Operations (*Framework*, pages 25–26; *Supplement*, pages 7–8)
- Patterns, Relations, and Algebra (*Framework*, page 34; *Supplement*, page 8)
- Geometry (*Framework*, page 42; *Supplement*, page 9)
- Measurement (*Framework*, page 50; *Supplement*, pages 9–10)
- Data Analysis, Statistics, and Probability (*Framework*, page 58; *Supplement*, page 10)

The *Mathematics Curriculum Framework* and *Supplement* are available on the Department website at www.doe.mass.edu/frameworks/current.html.

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework content strands listed above.

Test Sessions

The grade 5 Mathematics test included two separate test sessions. Each session included multiple-choice, short-answer, and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

Each student taking the grade 5 Mathematics test was provided with a plastic ruler and a grade 5 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this chapter. An image of the ruler is not reproduced in this publication.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Mathematics test sessions. No calculators, other reference tools, or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the released item table.

Mathematics

SESSION 1

You may use your reference sheet and MCAS ruler during this session.

*You may **not** use a calculator during this session.*



DIRECTIONS

This session contains eight multiple-choice questions, one short-answer question, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 Which of the following has a value equivalent to the expression below?

$$6 \times (10 + 8)$$

- A. $6 \times 10 + 8$
- B. $6 + 10 \times 8$
- C. 6×18
- D. $6 + 80$

- 2 The floor of Lucy's classroom is in the shape of a rectangle. It is 20 yards long and its area is 180 square yards.

What is the width of Lucy's classroom?

- A. 9 yards
- B. 18 yards
- C. 50 yards
- D. 70 yards

- 3 The Channel Tunnel runs beneath the English Channel between England and France. It is 31.35 miles long.

Which expression represents the number 31.35 in expanded notation?

- A. $(3 \times 1000) + (1 \times 100) + (3 \times 10) + 5$
- B. $(3 \times 100) + (1 \times 10) + (5 \times 0.1)$
- C. $(3 \times 10) + 1 + (3 \times 0.01) + (5 \times 0.001)$
- D. $(3 \times 10) + 1 + (3 \times 0.1) + (5 \times 0.01)$

Question 4 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

- 4** Erik has a block of clay in the shape of a cube. Each edge of his block of clay has a length of 10 centimeters.

What is the volume, in cubic centimeters, of Erik's block of clay?

Question 5 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 5 in the space provided in your Student Answer Booklet.

5 Harrison plans to make 15 dozen cookies for a family reunion.

- a. How many cookies are equivalent to 15 dozen cookies? Show or explain how you got your answer.

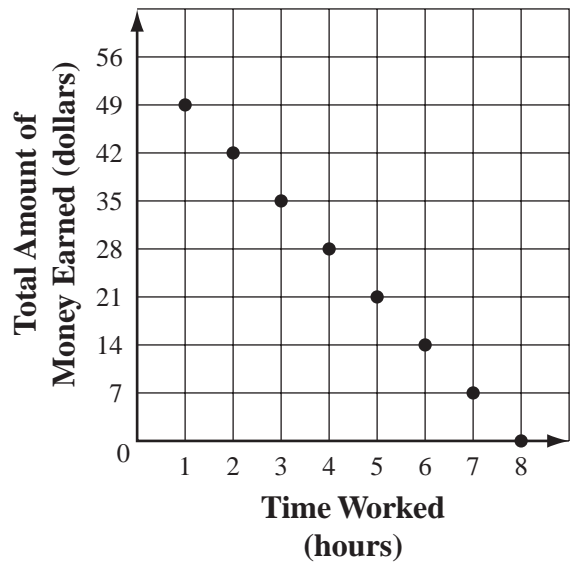
Harrison will bake the cookies on cookie sheets. He will put 18 cookies on each cookie sheet. He will put 2 cookie sheets in his oven at the same time. The cookies take 10 minutes to bake.

- b. What is the total amount of baking time that it will take Harrison to bake all of the cookies? Show or explain how you got your answer.

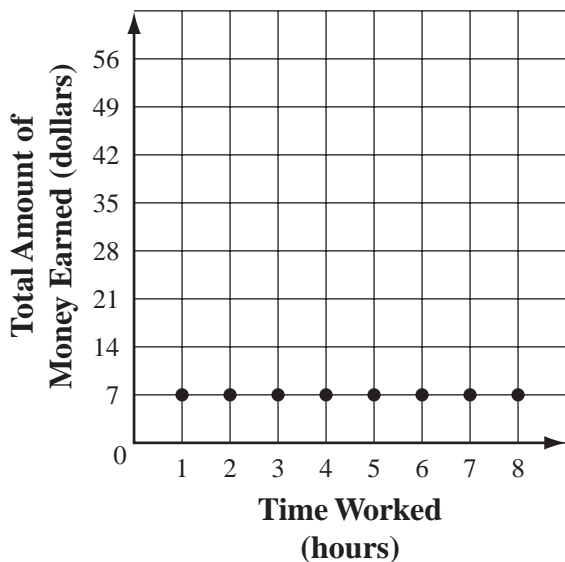
Mark your answers to multiple-choice questions 6 through 10 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 6 Sherry earns \$7 for each hour she works. Which of the following graphs represents the total amount of money, in dollars, that Sherry will earn for time worked?

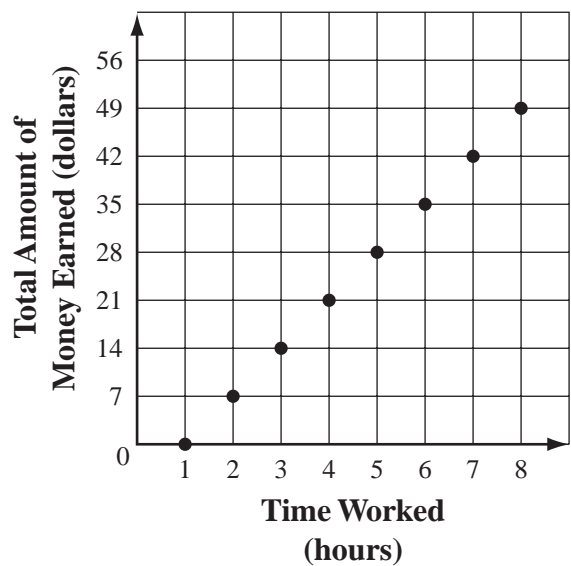
A. **Total Amount of Money Sherry Will Earn**



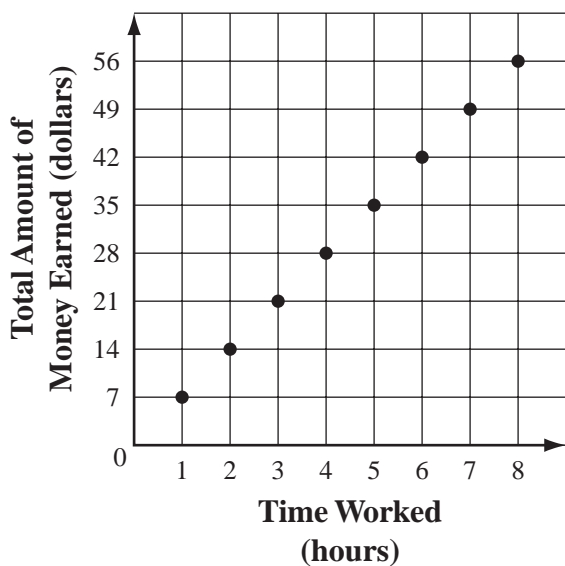
C. **Total Amount of Money Sherry Will Earn**



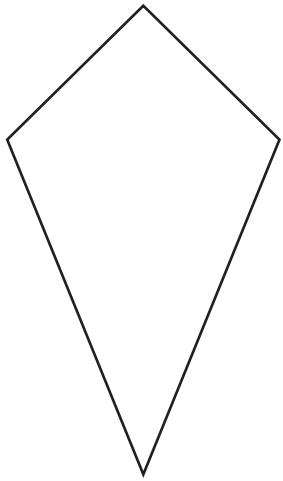
B. **Total Amount of Money Sherry Will Earn**



D. **Total Amount of Money Sherry Will Earn**



- 7 Javier drew the quadrilateral shown below.



How many lines of symmetry does Javier's quadrilateral appear to have?

- A. 0
- B. 1
- C. 2
- D. 4

- 8 Ginny sells popcorn at basketball games. The expression below represents the total amount of money Ginny will have if she sells p bags of popcorn.

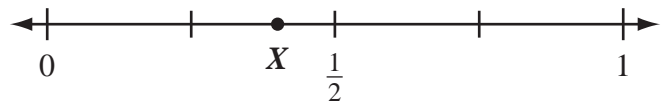
$$(2.50 \times p) + 5.00$$

What is the total amount of money Ginny will have if she sells 20 bags of popcorn?

- A. \$7.50
- B. \$27.50
- C. \$55.00
- D. \$62.50

- 9 A pyramid has five faces. Four of the faces are congruent equilateral triangles. What is the shape of the fifth face?
- A. a square
 - B. a right triangle
 - C. an equilateral triangle
 - D. a rectangle that is not a square

- 10 Ms. Thomas drew the number line shown below.



Which of the following fractions is best represented by point X?

- A. $\frac{1}{5}$
- B. $\frac{1}{4}$
- C. $\frac{2}{5}$
- D. $\frac{3}{6}$

Mathematics

SESSION 2

You may use your reference sheet and MCAS ruler during this session.

You may **not** use a calculator during this session.



DIRECTIONS

This session contains eight multiple-choice questions, two short-answer questions, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 11** Carolina made the input-output table shown below.

Input	Output
3	9
4	12
?	24
12	36

Based on the table, what is the input when the output is 24?

- A. 11
- B. 8
- C. 6
- D. 3

- 12** An earthworm has a length of 12.8 centimeters. What is the length, in millimeters, of the earthworm?

- A. 0.128 millimeter
- B. 1.28 millimeters
- C. 128 millimeters
- D. 1280 millimeters

- 13 Pat bought one of each of the items in the table below.

Items Pat Bought

Item	Cost
Blender	\$34.88
Coffeemaker	\$29.95
Can Opener	\$14.29
Rice Cooker	\$30.25

Which of the following sums is closest to the total cost, in dollars, of the four items that Pat bought?

- A. $35 + 30 + 14 + 30$
- B. $34 + 29 + 14 + 30$
- C. $35 + 30 + 15 + 31$
- D. $30 + 30 + 10 + 30$

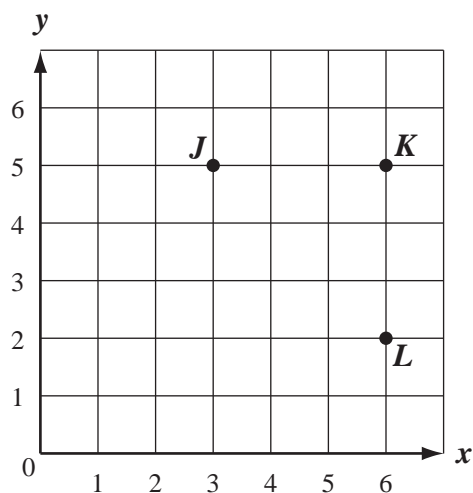
- 14 Which of the following is equivalent to the expression below?

$$\frac{2}{5} + \frac{1}{4}$$

- A. $\frac{2}{20}$
- B. $\frac{3}{20}$
- C. $\frac{9}{20}$
- D. $\frac{13}{20}$

Questions 15 and 16 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 15 Tiesha plotted points J , K , and L on a coordinate grid, as shown below.



Tiesha wants to plot point M so that points J , K , L , and M form the vertices of a square. What ordered pair represents the best location for Tiesha to plot point M ?

Write your answer to question 16 in the box provided in your Student Answer Booklet.

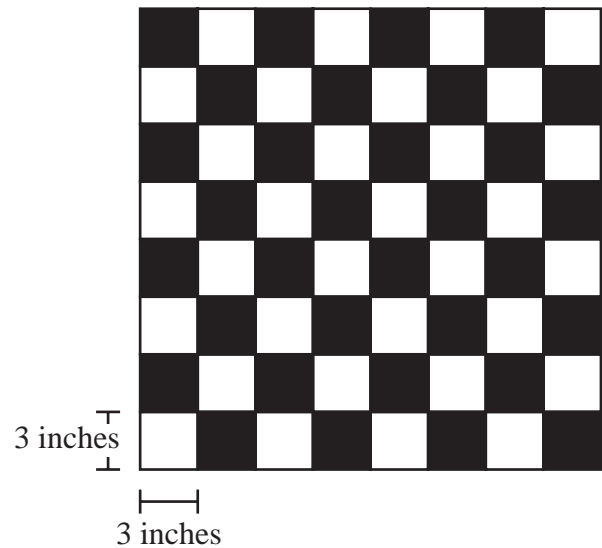
- 16** One megaton is equivalent to 1,000,000 tons. What is 1,000,000 written as a power of ten?

Mark your answers to multiple-choice questions 17 through 20 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

17 Which of the following is true?

- A. $5.199 < 5.242 < 5.24$
- B. $5.199 < 5.24 < 5.242$
- C. $5.242 < 5.24 < 5.199$
- D. $5.24 < 5.199 < 5.242$

18 Edgar used congruent squares to make a checkerboard, as shown below.



The sides of each square have a length of 3 inches. What is the perimeter of Edgar's checkerboard?

- A. 72 inches
- B. 96 inches
- C. 288 inches
- D. 576 inches

19 Felicia drew a polygon.

- Each side of her polygon has the same length.
- There are no parallel sides in her polygon.

Which of the following could be the polygon Felicia drew?

- A. equilateral triangle
- B. right triangle
- C. trapezoid
- D. rhombus

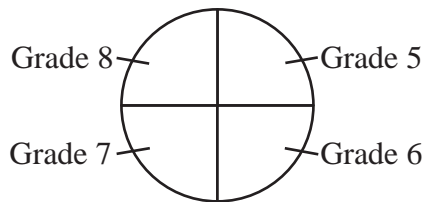
- 20 A librarian recorded the number of books checked out one day by students in each of 4 different grades. His results are shown in the table below.

**Library Books
Checked Out**

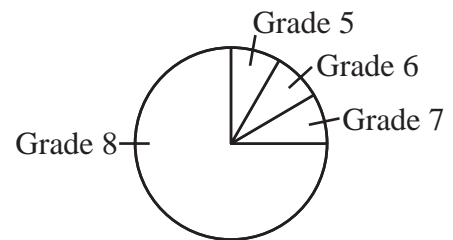
Grade	Number of Books
5	50
6	49
7	98
8	197

Which of the following circle graphs best represents the librarian's data?

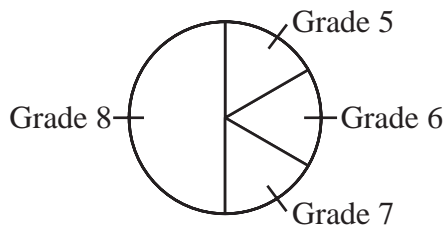
A. **Library Books
Checked Out**



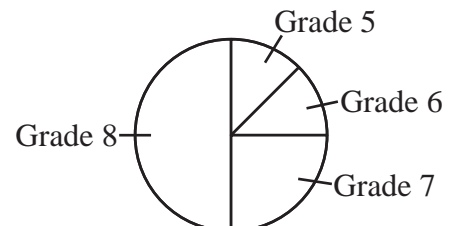
C. **Library Books
Checked Out**



B. **Library Books
Checked Out**



D. **Library Books
Checked Out**



Question 21 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21** Abe stacked boxes onto a truck. Each box he stacked had the same weight. The table below shows the total weight for different numbers of boxes.

Total Weight of Boxes

Number of Boxes	Total Weight (in pounds)
2	50
4	100
6	150

- What is the total weight, in pounds, of 8 boxes? Show or explain how you got your answer.
- Based on the table, write or describe a rule that can be used to find the weight of n boxes, where n is any number of boxes.
- Is it possible for the total weight of the boxes Abe stacked onto the truck to be **exactly** 520 pounds? Show or explain how you got your answer.

PERIMETER (P) FORMULAS

perimeter = distance around

square $P = 4 \times s$
(s = length of a side)

rectangle $P = (2 \times l) + (2 \times w)$
(l = length; w = width)

triangle $P = a + b + c$
(a , b , and c are the lengths of the sides)

VOLUME (V) FORMULAS

rectangular prism $V = l \times w \times h$
(l = length; w = width; h = height)

cube $V = s \times s \times s$
(s = length of an edge)

AREA (A) FORMULAS

square $A = s \times s$
(s = length of a side)

rectangle $A = l \times w$
(l = length; w = width)

triangle $A = \frac{1}{2} \times b \times h$
(b = length of the base;
 h = height)

Grade 5 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	175	<i>Number Sense and Operations</i>	5.N.10	C
2	175	<i>Measurement</i>	5.M.1	A
3	175	<i>Number Sense and Operations</i>	5.N.3	D
4	176	<i>Measurement</i>	5.M.4	1000 cubic centimeters
5	177	<i>Number Sense and Operations</i>	5.N.9	
6	178	<i>Patterns, Relations, and Algebra</i>	5.P.6	D
7	179	<i>Geometry</i>	5.G.6	B
8	179	<i>Patterns, Relations, and Algebra</i>	5.P.2	C
9	180	<i>Geometry</i>	5.G.2	A
10	180	<i>Number Sense and Operations</i>	5.N.4	C
11	181	<i>Patterns, Relations, and Algebra</i>	5.P.4	B
12	181	<i>Measurement</i>	5.M.3	C
13	182	<i>Number Sense and Operations</i>	5.N.14	A
14	182	<i>Number Sense and Operations</i>	5.N.13	D
15	183	<i>Geometry</i>	5.G.4	(3, 2)
16	184	<i>Number Sense and Operations</i>	5.N.1	10^6
17	185	<i>Number Sense and Operations</i>	5.N.7	B
18	185	<i>Measurement</i>	5.M.1	B
19	186	<i>Geometry</i>	5.G.1	A
20	187	<i>Data Analysis, Statistics, and Probability</i>	5.D.2	D
21	188	<i>Patterns, Relations, and Algebra</i>	5.P.4	

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

Grade 5 Mathematics
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Patterns, Relations, and Algebra</i>	5.P.6
23	<i>Number Sense and Operations</i>	5.N.1
24	<i>Number Sense and Operations</i>	5.N.7
25	<i>Patterns, Relations, and Algebra</i>	5.P.4
26	<i>Patterns, Relations, and Algebra</i>	5.P.2
27	<i>Number Sense and Operations</i>	5.N.12
28	<i>Number Sense and Operations</i>	5.N.13
29	<i>Number Sense and Operations</i>	5.N.2
30	<i>Number Sense and Operations</i>	5.N.13
31	<i>Number Sense and Operations</i>	5.N.12
32	<i>Measurement</i>	5.M.3
33	<i>Patterns, Relations, and Algebra</i>	5.P.4
34	<i>Number Sense and Operations</i>	5.N.12
35	<i>Geometry</i>	5.G.1
36	<i>Number Sense and Operations</i>	5.N.3
37	<i>Number Sense and Operations</i>	5.N.4
38	<i>Patterns, Relations, and Algebra</i>	5.P.6
39	<i>Patterns, Relations, and Algebra</i>	5.P.2
40	<i>Data Analysis, Statistics, and Probability</i>	5.D.1
41	<i>Patterns, Relations, and Algebra</i>	5.P.4
42	<i>Number Sense and Operations</i>	5.N.9

XII. Mathematics, Grade 6

Grade 6 Mathematics Test

The spring 2012 grade 6 Mathematics test was based on learning standards in the five major content strands in the Massachusetts *Mathematics Curriculum Framework* (2000) listed below. Page numbers for the grades 5–6 *Framework* learning standards appear in parentheses.

- Number Sense and Operations (*Framework*, pages 25–26)
- Patterns, Relations, and Algebra (*Framework*, page 34)
- Geometry (*Framework*, page 42)
- Measurement (*Framework*, page 50)
- Data Analysis, Statistics, and Probability (*Framework*, page 58)

The *Mathematics Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework content strands listed above.

Test Sessions

The grade 6 Mathematics test included two separate test sessions. Each session included multiple-choice, short-answer, and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

Each student taking the grade 6 Mathematics test was provided with a plastic ruler and a grade 6 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this chapter. An image of the ruler is not reproduced in this publication.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Mathematics test sessions. No calculators, other reference tools, or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the released item table.

Mathematics

SESSION 1

You may use your reference sheet and MCAS ruler during this session.
You may **not** use a calculator during this session.



DIRECTIONS

This session contains nine multiple-choice questions, two short-answer questions, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 Jillian works at a ski resort. She recorded the number of snowboards that were rented each day for two weeks in the stem-and-leaf plot below.

Number of Snowboards Rented Each Day	
5	1 3 3 3
6	2 4 5 7 8
7	5 5 8
8	3 6

Key
6 3 represents 63

What is the mode of the data in the stem-and-leaf plot?

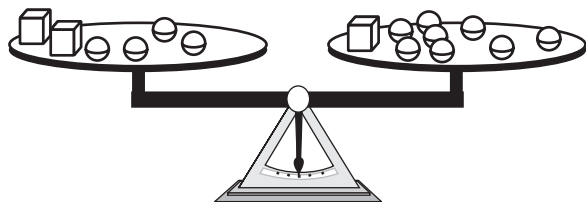
- A. 53
- B. 66
- C. 75
- D. 86

- 2 Which of the following is equivalent to the expression below?

$$6^5$$

- A. $6 \times 6 \times 6 \times 6 \times 6 \times 6$
- B. $5 \times 5 \times 5 \times 5 \times 5 \times 5$
- C. $6 \times 6 \times 6 \times 6 \times 6$
- D. 5×6

- 3 The scale shown below is balanced.



Based on this scale, which of the following shows the correct relationship between the mass of one cube and the mass of the spheres?

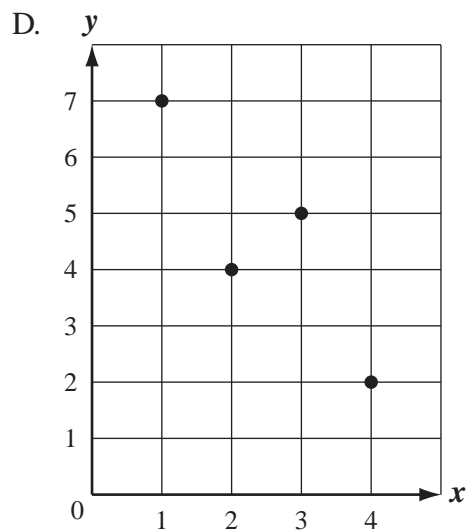
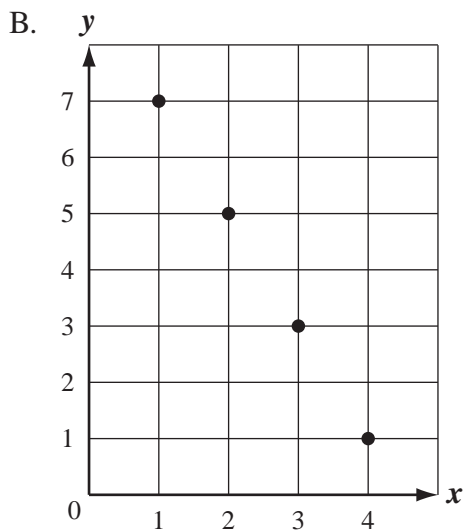
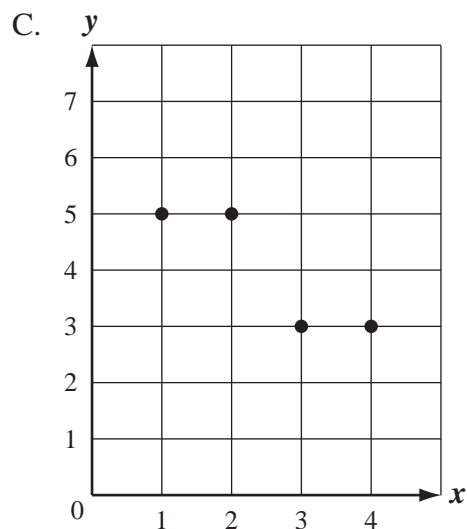
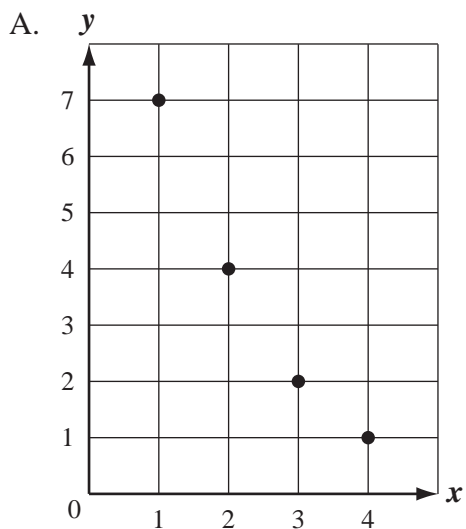
- A. $\square = \circ \circ$
- B. $\square = \circ \circ \circ$
- C. $\square = \circ \circ \circ \circ$
- D. $\square = \begin{matrix} \circ & \circ & \circ & \circ \\ \circ & \circ & \circ & \circ \end{matrix}$

- 4 Jonas sold a total of 319 cups of lemonade in June and July. He sold 136 cups of lemonade in June.

Which of the following represents the number of cups of lemonade Jonas sold in July?

- A. $183 + 319$
- B. $183 - 319$
- C. $319 + 136$
- D. $319 - 136$

- 5 Which of the following graphs shows a constant rate of change between the variables x and y ?



Questions 6 and 7 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

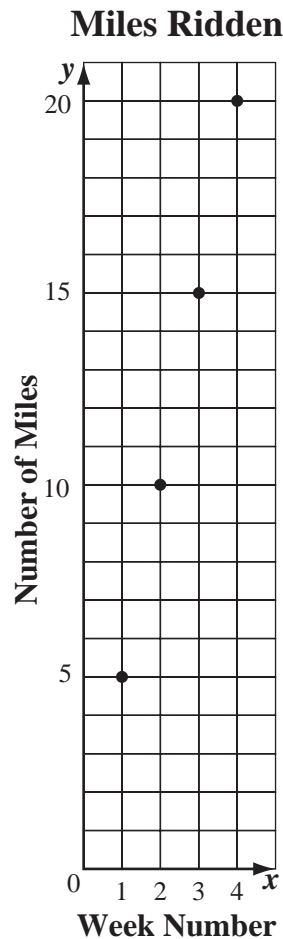
- 6 What is 5% written as a fraction in **simplest form**?

- 7 What is the value of the expression below when $\square = 5$?

$$\frac{55}{\square} - 2$$

Mark your answers to multiple-choice questions 8 through 11 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

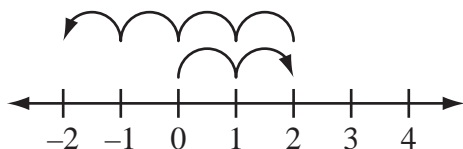
- 8 The graph below shows the number of miles Michael rode his bike each week for four weeks.



What is the relationship between the number of miles Michael rode his bike and the week number?

- A. Number of Miles = Week Number \div 5
- B. Number of Miles = Week Number \times 5
- C. Number of Miles = Week Number $-$ 5
- D. Number of Miles = Week Number $+$ 5

- 9 Which of the following equations is best represented on the number line below?



- A. $2 + (-4) = -2$
- B. $2 + (-2) = 0$
- C. $4 + (-2) = 2$
- D. $0 + (-2) = -2$

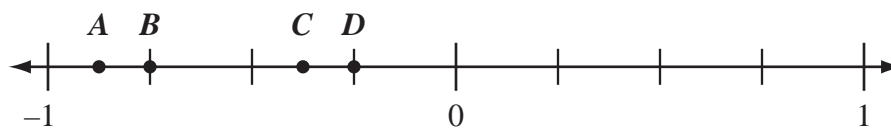
- 10 Vicky wrote the equation shown below in her notebook.

$$x - 9 = 26$$

In order for Vicky's equation to be true, which of the following equations must also be true?

- A. $x = 9 - 26$
- B. $x = 9 \times 26$
- C. $x = 26 - 9$
- D. $x = 26 + 9$

- 11 Points A , B , C , and D are shown on the number line below.



Which point is located at -0.75 on the number line?

- A. point A
- B. point B
- C. point C
- D. point D

Question 12 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 12 in the space provided in your Student Answer Booklet.

- 12** Jan is using a map to plan a two-day hiking trip. The scale for the map she is using is shown below.

Scale
1 inch : $\frac{1}{2}$ mile

- The distance that Jan will hike on the first day is equal to 12 inches on the map. What is the actual distance, in miles, that Jan will hike on the first day? Show or explain how you got your answer.
- The actual distance that Jan will hike on the second day is $5\frac{1}{2}$ miles. What distance on the map, in inches, represents $5\frac{1}{2}$ miles? Show or explain how you got your answer.
- Based on the scale Jan used, how many feet are represented by 1 inch on the map? Show or explain how you got your answer. (1 mile = 5280 feet)

Mathematics

SESSION 2

You may use your reference sheet and MCAS ruler during this session.

You may **not** use a calculator during this session.



DIRECTIONS

This session contains seven multiple-choice questions, one short-answer question, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 13** The table below shows the distance, in miles, Mr. Klein drove each day for 5 days.

Mr. Klein's Driving Distances

Day	1	2	3	4	5
Number of Miles	65	142	76	98	139

What was the mean number of miles per day Mr. Klein drove for the 5 days?

- A. 76
- B. 98
- C. 104
- D. 142

- 14** Jean and Clint stack boxes at a warehouse. Jean stacks 50 boxes per hour. Clint stacks 60 boxes per hour. Which of the following expressions represents the total number of boxes that both Jean and Clint stack in h hours, where h is any number of hours?

- A. $50h + 60$
- B. $50 + 60h$
- C. $50h + 60h$
- D. $50 + h + 60 + h$

- 15 Which of the following represents the fraction of Figure X that is shaded?

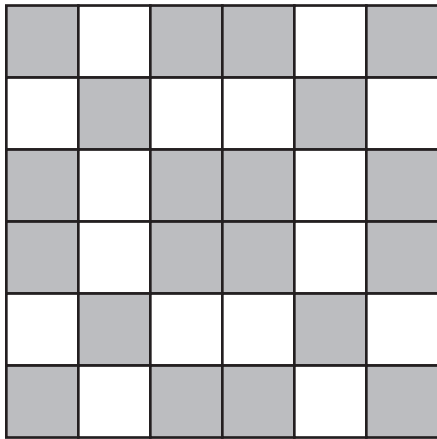


Figure X

- A. $\frac{1}{2}$
B. $\frac{2}{3}$
C. $\frac{4}{5}$
D. $\frac{5}{9}$

- 16 Joe wants to enter a racing game.

- It costs \$5 to enter the first race.
- It costs \$2 to enter each additional race.

Which of the following tables correctly represents the costs of entering races in the game?

A. **Racing Game Costs**

Number of Races	Cost
1	\$2
2	\$4
3	\$6
4	\$8

C. **Racing Game Costs**

Number of Races	Cost
1	\$ 5
2	\$10
3	\$15
4	\$20

B. **Racing Game Costs**

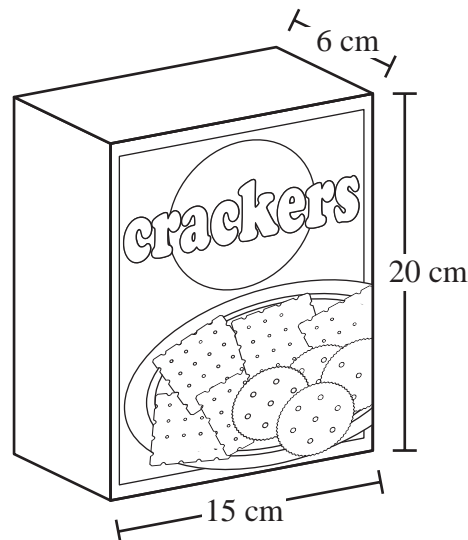
Number of Races	Cost
1	\$ 5
2	\$ 7
3	\$ 9
4	\$11

D. **Racing Game Costs**

Number of Races	Cost
1	\$ 5
2	\$12
3	\$19
4	\$26

Question 17 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

- 17 A box of crackers is in the shape of a rectangular prism and has the dimensions shown in the diagram below.



What is the surface area, in square centimeters, of the box of crackers?

Question 18 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 18 in the space provided in your Student Answer Booklet.

- 18** Ms. Diaz works at a zoo. She created an exhibit with the animals listed in the table below.

Animal Exhibit

Type of Animal	Number
elephant	8
giraffe	12
rhino	4

- a. What fraction of the animals are giraffes? Simplify your answer to lowest terms. Show or explain how you got your answer.

Ms. Diaz plans to add more animals to the exhibit.

- She will add 2 more elephants.
 - She will add more giraffes and rhinos so that the ratio of elephants to other animals is the same as before.
- b. What is the new total number of animals that will be in the exhibit? Show or explain how you got your answer.

Mark your answers to multiple-choice questions 19 through 21 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 19 Ms. Jarman had a box of 120 pencils.
- She gave 6 pencils to each student in her class.
 - There were 12 pencils left over.

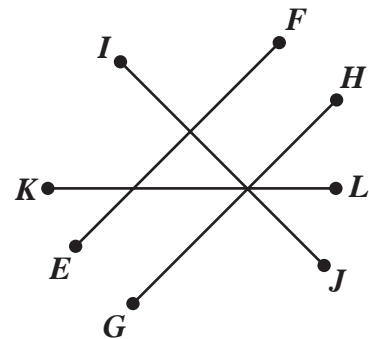
Ms. Jarman chose n to represent the number of students in her class. She wrote the equation below to represent this situation.

$$6 \times n + 12 = 120$$

What value of n makes Ms. Jarman's equation true?

- A. 6
- B. 10
- C. 12
- D. 18

- 20 Michelle drew the line segments shown below on a piece of paper.



Which of the following pairs of line segments appear to be perpendicular?

- A. \overline{GH} and \overline{KL}
- B. \overline{GH} and \overline{IJ}
- C. \overline{EF} and \overline{KL}
- D. \overline{EF} and \overline{GH}

- 21 Which of the following three-dimensional shapes has 1 rectangular face and 4 triangular faces?

- A. rectangular pyramid
- B. triangular pyramid
- C. rectangular prism
- D. triangular prism

PERIMETER FORMULAS

perimeter = distance around

square $P = 4s$

rectangle $P = 2b + 2h$

OR

$P = 2l + 2w$

triangle $P = a + b + c$

AREA FORMULAS

square $A = s \times s$

rectangle $A = bh$

OR

$A = lw$

parallelogram $A = bh$

triangle $A = \frac{1}{2}bh$

circle $A = \pi r^2$

VOLUME FORMULAS

rectangular prism $V = lwh$

cube $V = s \times s \times s$

(s = length of an edge)

CIRCLE FORMULAS

$C = 2\pi r$

OR

$C = \pi d$

$A = \pi r^2$

Grade 6 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	196	<i>Data Analysis, Statistics, and Probability</i>	6.D.1	A
2	196	<i>Number Sense and Operations</i>	6.N.1	C
3	197	<i>Patterns, Relations, and Algebra</i>	6.P.5	C
4	197	<i>Number Sense and Operations</i>	6.N.9	D
5	198	<i>Patterns, Relations, and Algebra</i>	6.P.7	B
6	199	<i>Number Sense and Operations</i>	6.N.5	$\frac{1}{20}$
7	199	<i>Patterns, Relations, and Algebra</i>	6.P.2	9
8	200	<i>Patterns, Relations, and Algebra</i>	6.P.6	B
9	201	<i>Number Sense and Operations</i>	6.N.10	A
10	201	<i>Patterns, Relations, and Algebra</i>	6.P.3	D
11	202	<i>Number Sense and Operations</i>	6.N.6	B
12	203	<i>Measurement</i>	6.M.3	
13	204	<i>Data Analysis, Statistics, and Probability</i>	6.D.1	C
14	204	<i>Patterns, Relations, and Algebra</i>	6.P.4	C
15	205	<i>Number Sense and Operations</i>	6.N.4	D
16	206	<i>Patterns, Relations, and Algebra</i>	6.P.4	B
17	207	<i>Measurement</i>	6.M.6	1,020 square centimeters
18	208	<i>Number Sense and Operations</i>	6.N.4	
19	209	<i>Patterns, Relations, and Algebra</i>	6.P.5	D
20	209	<i>Geometry</i>	6.G.3	B
21	209	<i>Geometry</i>	6.G.2	A

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

Grade 6 Mathematics
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Patterns, Relations, and Algebra</i>	6.P.4
23	<i>Number Sense and Operations</i>	6.N.5
24	<i>Number Sense and Operations</i>	6.N.7
25	<i>Number Sense and Operations</i>	6.N.14
26	<i>Patterns, Relations, and Algebra</i>	6.P.4
27	<i>Geometry</i>	6.G.1
28	<i>Patterns, Relations, and Algebra</i>	6.P.2
29	<i>Geometry</i>	6.G.9
30	<i>Measurement</i>	6.M.1
31	<i>Measurement</i>	6.M.6
32	<i>Measurement</i>	6.M.4
33	<i>Patterns, Relations, and Algebra</i>	6.P.6
34	<i>Number Sense and Operations</i>	6.N.14
35	<i>Number Sense and Operations</i>	6.N.8
36	<i>Number Sense and Operations</i>	6.N.4
37	<i>Geometry</i>	6.G.4
38	<i>Patterns, Relations, and Algebra</i>	6.P.5
39	<i>Number Sense and Operations</i>	6.N.7
40	<i>Number Sense and Operations</i>	6.N.13
41	<i>Number Sense and Operations</i>	6.N.13
42	<i>Data Analysis, Statistics, and Probability</i>	6.D.2

XIII. Mathematics, Grade 7

Grade 7 Mathematics Test

The spring 2012 grade 7 Mathematics test was based on learning standards in the five major content strands in the Massachusetts *Mathematics Curriculum Framework* (2000) listed below. Specific learning standards for grade 7 are found in the *Supplement to the Massachusetts Mathematics Curriculum Framework* (2004). Page numbers for the grades 7–8 *Framework* learning standards and for the grade 7 *Supplement* standards appear in parentheses.

- Number Sense and Operations (*Framework*, page 62; *Supplement*, page 11)
- Patterns, Relations, and Algebra (*Framework*, page 63; *Supplement*, page 12)
- Geometry (*Framework*, page 64; *Supplement*, pages 12–13)
- Measurement (*Framework*, page 65; *Supplement*, page 13)
- Data Analysis, Statistics, and Probability (*Framework*, page 66; *Supplement*, page 14)

The *Mathematics Curriculum Framework* and *Supplement* are available on the Department website at www.doe.mass.edu/frameworks/current.html.

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework content strands listed above.

Test Sessions

The grade 7 Mathematics test included two separate test sessions. Each session included multiple-choice, short-answer, and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

Each student taking the grade 7 Mathematics test was provided with a plastic ruler and a grade 7 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this chapter. An image of the ruler is not reproduced in this publication.

During session 2, each student had sole access to a calculator with at least four functions and a square root key. Calculator use was not allowed during session 1.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Mathematics test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the released item table.

Mathematics

SESSION 1

You may use your reference sheet and MCAS ruler during this session.
You may **not** use a calculator during this session.



DIRECTIONS

This session contains eight multiple-choice questions, one short-answer question, and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 Sarah recorded the lengths of time, in seconds, of the first five commercials that aired during a television program. The times she recorded are shown in the table below.

**Television
Commercials**

Commercial	Length of Time (in seconds)
first	15
second	60
third	40
fourth	20
fifth	15

What is the mean of the lengths of time that Sarah recorded?

- A. 15 seconds
- B. 20 seconds
- C. 30 seconds
- D. 45 seconds

- 2 The ratio of the number of girls to the number of boys in a chess club is 3 to 2. There are 14 boys in the chess club.

What is the number of girls in the chess club?

- A. 7
- B. 9
- C. 21
- D. 23

- 3 The weights, in ounces, of three different packages of cookies are listed below.

7.7, $7\frac{1}{7}$, 7.25

Which list shows these weights in order from least to greatest?

- A. 7.25, $7\frac{1}{7}$, 7.7
- B. $7\frac{1}{7}$, 7.25, 7.7
- C. 7.25, 7.7, $7\frac{1}{7}$
- D. $7\frac{1}{7}$, 7.7, 7.25

Mark your answers to multiple-choice questions 4 through 6 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 4 What is the value of the expression below?

$$|3| + |-3| + |-1|$$

- A. -7
- B. -1
- C. 1
- D. 7

- 5 A park has a grassy section that covers $2\frac{1}{3}$ acres. Denny mowed half the grassy section.

What is the number of acres that Denny mowed?

- A. $1\frac{1}{6}$
- B. $1\frac{1}{3}$
- C. $1\frac{2}{3}$
- D. $1\frac{5}{6}$

- 6 Lara has \$12 in quarters. The equation below can be used to solve for q , the number of quarters Lara has.

$$0.25q = 12$$

Which of the following describes a way to solve for q in one step?

- A. add 0.25 to both sides
- B. subtract 0.25 from both sides
- C. multiply both sides by 0.25
- D. divide both sides by 0.25

Question 7 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

7 Compute:

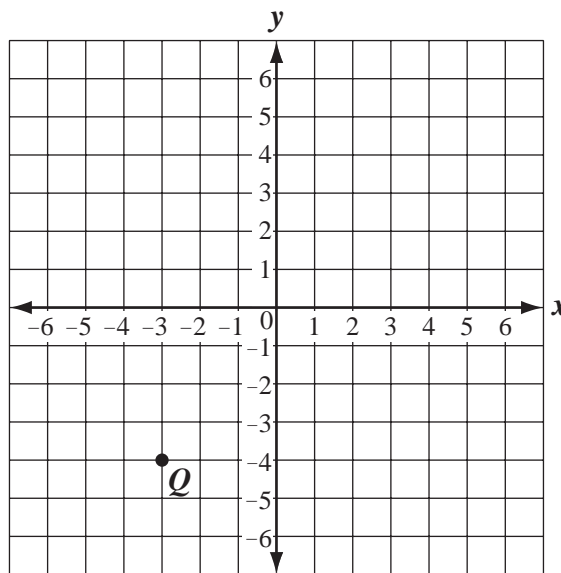
$$\frac{3}{8} \cdot \frac{2}{3} \cdot \frac{3}{4}$$

Question 8 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 8 in the space provided in your Student Answer Booklet.

- 8** On the grid in your Student Answer Booklet, copy the x -axis, the y -axis, and point Q , as shown below.



- What are the coordinates of point Q ?
- On your grid, plot and label points $S(-5, 0)$ and $R(-3, 0)$.
- On your grid, plot and label a point T so that quadrilateral $QRST$ is a rectangle. What are the coordinates of point T ?
- On your grid, draw a second rectangle that meets the following requirements:
 - It is congruent to rectangle $QRST$.
 - The coordinates of each vertex are positive numbers.
 - The vertices are labeled U , V , W , and X .
- What are the coordinates of each vertex of rectangle $UVWX$?

Mark your answers to multiple-choice questions 9 and 10 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 9 Brad has a blue highlighter, a yellow highlighter, a purple highlighter, and a green highlighter in his desk. All four highlighters are the same size and shape. He will randomly select one, use it to highlight a word, and put it back in his desk. Then Brad will randomly select a second highlighter.

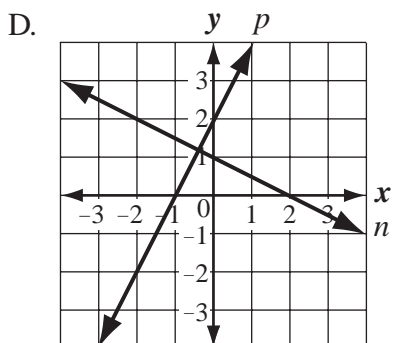
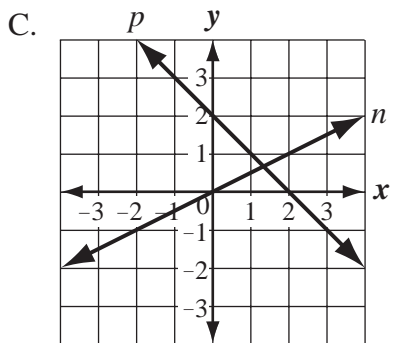
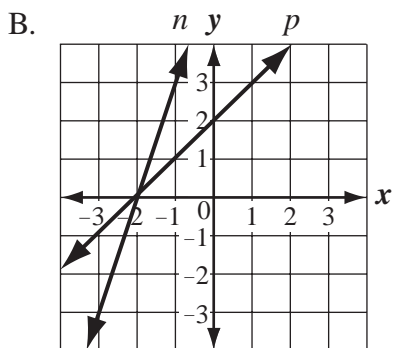
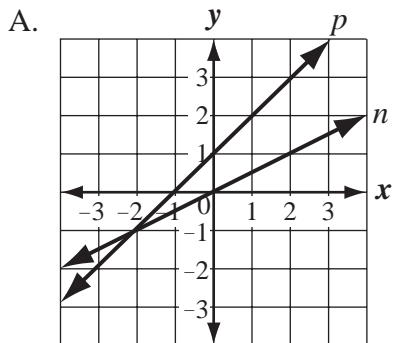
The organized list below shows all the possible combinations of colors of highlighters Brad can select when he randomly selects a highlighter two times.

blue – blue	yellow – blue	purple – blue	green – blue
blue – yellow	yellow – yellow	purple – yellow	green – yellow
blue – purple	yellow – purple	purple – purple	green – purple
blue – green	yellow – green	purple – green	green – green

What is the probability that Brad will select, in any order, a blue highlighter and a green highlighter?

- A. $\frac{1}{16}$
- B. $\frac{1}{8}$
- C. $\frac{1}{4}$
- D. $\frac{1}{2}$

- 10 In which of the following graphs does line p have a positive rate of change and line n have a negative rate of change?



Question 11 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 11 in the space provided in your Student Answer Booklet.

- 11** The first five terms in a number pattern are shown below.

7, 10, 13, 16, 19

The pattern continues using the same rule.

- a. What is the next term in the pattern? Show or explain how you got your answer.
- b. What is the 20th term in the pattern? Show or explain how you got your answer.
- c. Write an expression that can be used to find the value of the n th term in the pattern.

Mathematics

SESSION 2

You may use your reference sheet and MCAS ruler during this session.

You may use a calculator during this session.



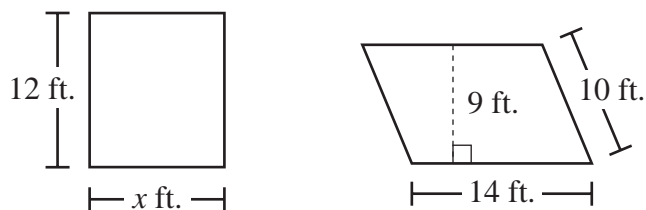
DIRECTIONS

This session contains eight multiple-choice questions and two short-answer questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 12 The price of each ticket to the spring choral concert is \$3. Which of the following expressions represents the price of t tickets to the concert?

A. $3 + t$
B. $3 - t$
C. $3 \cdot t$
D. $3 \div t$

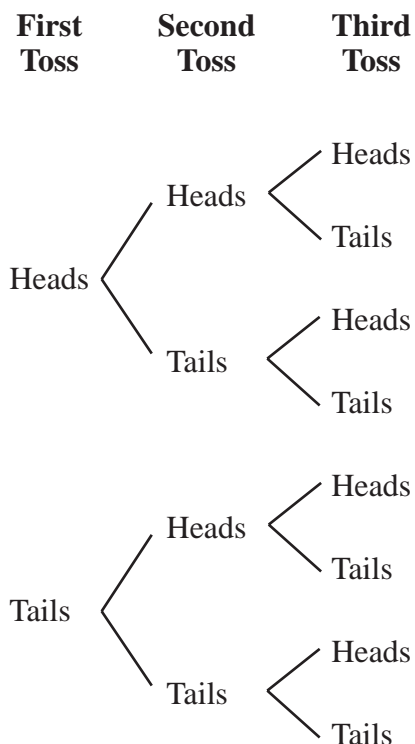
- 13 A rectangle and a parallelogram have the same area. The rectangle, the parallelogram, and some of their dimensions are shown below.



Based on the dimensions shown, what is the value of x ?

A. 7.5
B. 10.5
C. 11.7
D. 16.8

- 14 The tree diagram below shows all of the possible combinations that can occur when a fair coin is tossed three times.



What is the probability that a person who tosses a fair coin three times will get heads twice and tails once in any order?

- A. $\frac{1}{8}$
 B. $\frac{3}{14}$
 C. $\frac{3}{8}$
 D. $\frac{3}{5}$

- 15 Burke wrote the equation shown below.

$$4x + 8 = 16$$

Which of the following equations is equivalent to Burke's equation?

- A. $x + 8 = 4$
 B. $x + 8 = 12$
 C. $4x = 8$
 D. $4x = 24$

- 16 Justine paid \$1.16 for 2 pounds of bananas. Dave bought 2.5 pounds of bananas at the same price per pound that Justine paid.

What was the total amount that Dave paid for his bananas?

- A. \$1.45
 B. \$1.74
 C. \$2.50
 D. \$2.90

Mark your answer to multiple-choice question 17 in the space provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

17 Juanita started a small business.

- In the first year, she spent \$12,000 for advertising.
- In the second year, she spent 40% more for advertising than she spent in the first year.

What was the total amount of money that Juanita spent for advertising in the **second** year?

- A. \$4,800
- B. \$12,480
- C. \$15,000
- D. \$16,800

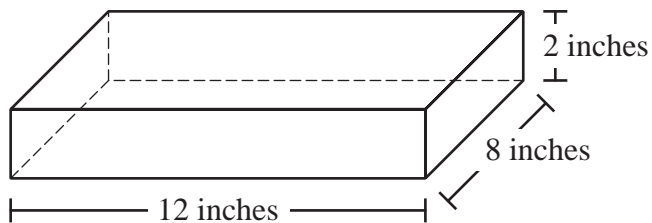
Questions 18 and 19 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 18 The list below shows the number of bottles of juice sold from a vending machine each day for 8 days.

25, 58, 40, 45, 65, 61, 48, 58

What is the median number of bottles of juice sold for the 8 days?

- 19 A rectangular prism and its dimensions are shown below.



What is the volume, in cubic inches, of the rectangular prism?

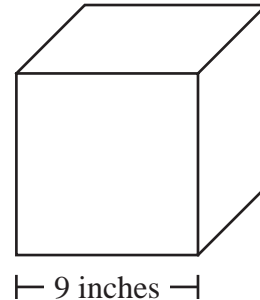
Mark your answers to multiple-choice questions 20 and 21 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 20 A baseball used by a professional baseball team must have a diameter that is between 2.86 inches and 2.94 inches.

Which of the following could be the diameter of a baseball used by a professional baseball team?

- A. $2\frac{7}{8}$ inches
- B. $2\frac{7}{9}$ inches
- C. $2\frac{8}{10}$ inches
- D. $2\frac{9}{11}$ inches

- 21 Matthew made a wooden cube that has an edge length of 9 inches, as shown below.



He painted half the faces of the cube red and the remaining faces yellow.

What is the surface area of the faces Matthew painted red?

- A. 162 square inches
- B. 243 square inches
- C. 365 square inches
- D. 486 square inches

PERIMETER FORMULAS

square $P = 4s$

rectangle $P = 2b + 2h$

OR

$$P = 2l + 2w$$

triangle $P = a + b + c$

AREA FORMULAS

square $A = s^2$

rectangle $A = bh$

OR

$$A = lw$$

parallelogram $A = bh$

triangle $A = \frac{1}{2}bh$

trapezoid $A = \frac{1}{2}h(b_1 + b_2)$

circle $A = \pi r^2$

TOTAL SURFACE AREA FORMULAS

rectangular prism . . $SA = 2(lw) + 2(hw) + 2(lh)$

cylinder $SA = 2\pi r^2 + 2\pi rh$

VOLUME FORMULAS

rectangular prism $V = lwh$

OR

$$V = Bh$$

(B = area of a base)

cube $V = s^3$
(s = length of an edge)

cylinder $V = \pi r^2 h$

CIRCLE FORMULAS

$$C = 2\pi r$$

OR

$$C = \pi d$$

$$A = \pi r^2$$

Grade 7 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	215	<i>Data Analysis, Statistics, and Probability</i>	7.D.2	C
2	215	<i>Number Sense and Operations</i>	7.N.2	C
3	215	<i>Number Sense and Operations</i>	7.N.1	B
4	216	<i>Number Sense and Operations</i>	7.N.4	D
5	216	<i>Number Sense and Operations</i>	7.N.9	A
6	216	<i>Patterns, Relations, and Algebra</i>	7.P.4	D
7	217	<i>Number Sense and Operations</i>	7.N.7	$\frac{3}{16}$
8	218	<i>Geometry</i>	7.G.4	
9	219	<i>Data Analysis, Statistics, and Probability</i>	7.D.3	B
10	220	<i>Patterns, Relations, and Algebra</i>	7.P.5	D
11	221	<i>Patterns, Relations, and Algebra</i>	7.P.1	
12	222	<i>Patterns, Relations, and Algebra</i>	7.P.3	C
13	222	<i>Measurement</i>	7.M.3	B
14	223	<i>Data Analysis, Statistics, and Probability</i>	7.D.3	C
15	223	<i>Patterns, Relations, and Algebra</i>	7.P.4	C
16	223	<i>Number Sense and Operations</i>	7.N.2	A
17	224	<i>Number Sense and Operations</i>	7.N.9	D
18	225	<i>Data Analysis, Statistics, and Probability</i>	7.D.2	53
19	225	<i>Measurement</i>	7.M.3	192 cubic inches
20	226	<i>Number Sense and Operations</i>	7.N.1	A
21	226	<i>Measurement</i>	7.M.3	B

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

Grade 7 Mathematics
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Number Sense and Operations</i>	7.N.6
23	<i>Patterns, Relations, and Algebra</i>	7.P.1
24	<i>Number Sense and Operations</i>	7.N.7
25	<i>Patterns, Relations, and Algebra</i>	7.P.2
26	<i>Patterns, Relations, and Algebra</i>	7.P.2
27	<i>Number Sense and Operations</i>	7.N.1
28	<i>Patterns, Relations, and Algebra</i>	7.P.3
29	<i>Patterns, Relations, and Algebra</i>	7.P.2
30	<i>Measurement</i>	7.M.3
31	<i>Number Sense and Operations</i>	7.N.4
32	<i>Patterns, Relations, and Algebra</i>	7.P.1
33	<i>Measurement</i>	7.M.3
34	<i>Measurement</i>	7.M.3
35	<i>Patterns, Relations, and Algebra</i>	7.P.5
36	<i>Geometry</i>	7.G.2
37	<i>Geometry</i>	7.G.4
38	<i>Geometry</i>	7.G.2
39	<i>Number Sense and Operations</i>	7.N.2
40	<i>Geometry</i>	7.G.3
41	<i>Patterns, Relations, and Algebra</i>	7.P.6
42	<i>Data Analysis, Statistics, and Probability</i>	7.D.3

XIV. Mathematics, Grade 8

Grade 8 Mathematics Test

The spring 2012 grade 8 Mathematics test was based on learning standards in the five major content strands in the Massachusetts *Mathematics Curriculum Framework* (2000) listed below.

- Number Sense and Operations
- Patterns, Relations, and Algebra
- Geometry
- Measurement
- Data Analysis, Statistics, and Probability

The grades 7–8 learning standards for each of these strands appear on pages 62–66 of the *Mathematics Curriculum Framework*, which is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework content strands listed above.

Test Sessions

The grade 8 Mathematics test included two separate test sessions. Each session included multiple-choice, short-answer, and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

Each student taking the grade 8 Mathematics test was provided with a plastic ruler and a grade 8 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this chapter. An image of the ruler is not reproduced in this publication.

During session 2, each student had sole access to a calculator with at least four functions and a square root key. Calculator use was not allowed during session 1.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Mathematics test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice and short-answer questions are also displayed in the released item table.

Mathematics

SESSION 1

You may use your reference sheet and MCAS ruler during this session.

You may **not** use a calculator during this session.



DIRECTIONS

This session contains nine multiple-choice questions, one short-answer question, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 A cooking instructor stated that 5 pounds of roast beef is needed to serve 8 people. Based on the instructor's statement, which of the following equations can be used to find r , the number of pounds of roast beef needed to serve 12 people?

A. $\frac{5}{8} = \frac{r}{12}$

B. $\frac{5}{8} = \frac{12}{r}$

C. $12r = 8 \cdot 5$

D. $12r = 8 \div 5$

- 2 Which of the following is equivalent to the expression below?

$$4(26 + 59)$$

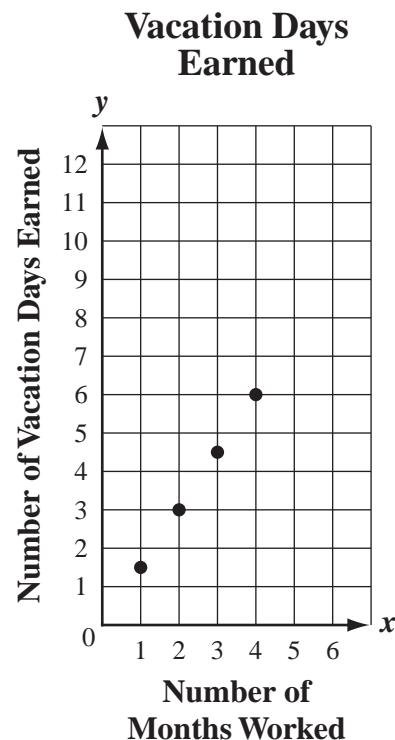
A. $4(26) + 4(59)$

B. $4(26) \cdot 4(59)$

C. $4(26) + 59$

D. $4(26) \cdot 59$

- 3 The graph below represents the relationship between x , the number of months Camille works, and y , the number of vacation days Camille earns.



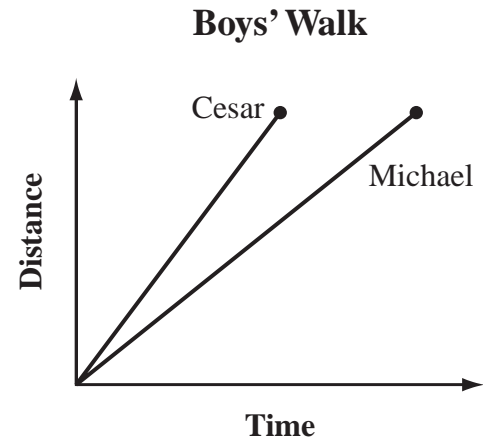
What is the number of vacation days Camille will earn for 6 months of work?

- A. 10
B. 9
C. 8
D. 4

4 Which of the following will **always** be similar?

- A. two different squares
- B. two different rectangles
- C. two different rhombuses
- D. two different parallelograms

5 Cesar and his brother Michael left home for a walk at the same time. The graph below shows the distance each boy walked over time.



Based on the graph, which statement is true?

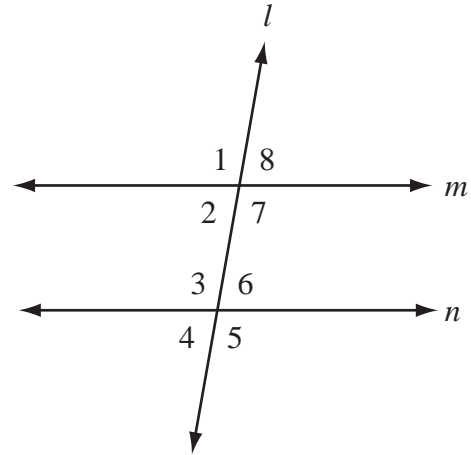
- A. Cesar walked at a greater speed than Michael did.
- B. Michael walked a greater distance than Cesar did.
- C. The boys walked for the same amount of time.
- D. The boys walked at the same speed.

Mark your answers to multiple-choice questions 6 through 8 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 6 A store claims it has served more than 3 billion customers. What is 3 billion written in scientific notation?

A. 3.0×10^6
 B. 3.0×10^9
 C. 3.0×10^{10}
 D. 3.0×10^{12}

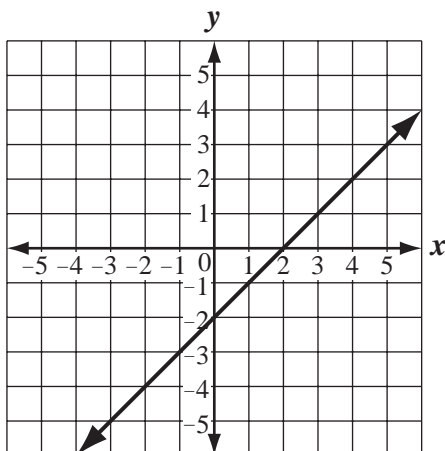
- 7 Line m and line n are parallel lines intersected by transversal line l , as shown below.



Which of the following pairs of angles **must** have the same measure?

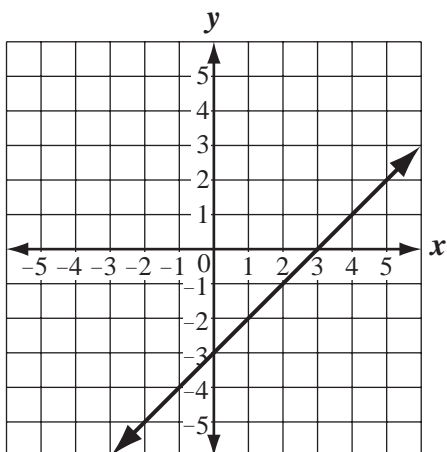
- A. $\angle 1$ and $\angle 8$
 B. $\angle 2$ and $\angle 6$
 C. $\angle 6$ and $\angle 7$
 D. $\angle 8$ and $\angle 5$

- 8 Tori graphed the line shown below.

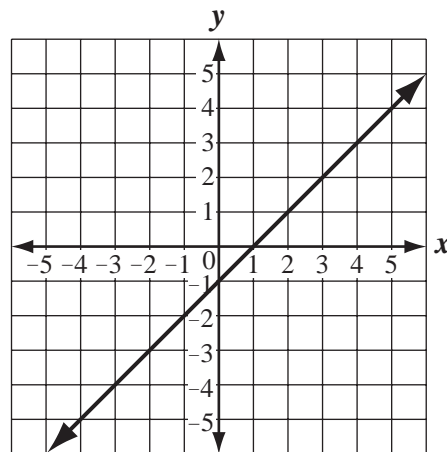


Which of the following graphs shows the result of increasing the y -intercept of Tori's line by 1 and leaving the slope the same?

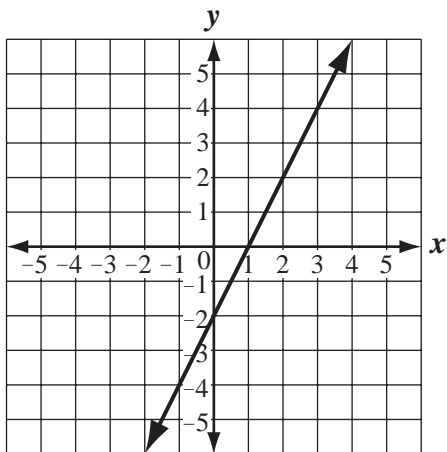
A.



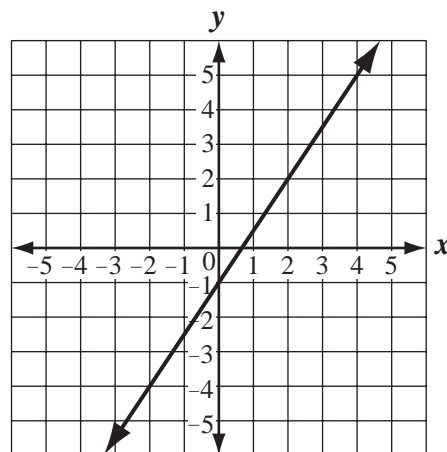
C.



B.



D.



Question 9 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

- 9** Brad purchased a bag of apples for \$2 and b pounds of bananas for \$0.50 per pound. He spent a total of \$3. The total price of his purchase is represented by the equation below.

$$0.5b + 2 = 3$$

What was the total number of pounds of bananas that Brad purchased?

Question 10 is an open-response question.

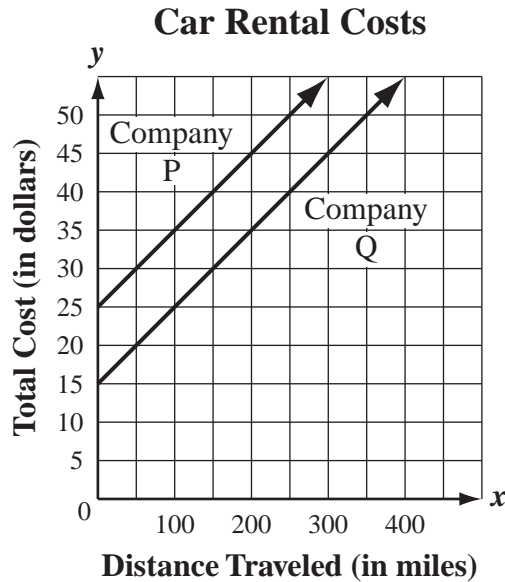
- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 10 in the space provided in your Student Answer Booklet.

- 10** One lap around a track is $\frac{1}{4}$ mile. On Monday, Stacy ran 11 laps.
- What was the total number of miles that Stacy ran on Monday? Show or explain how you got your answer.
 - It took Stacy $\frac{1}{2}$ hour to run 11 laps on Monday. What was Stacy's average speed, in miles per hour, on Monday? Show or explain how you got your answer.
 - Stacy's goal is to run at an average speed of 1 mile per 10 minutes. What is the number of laps that she must run in $\frac{1}{2}$ hour to reach her goal? Show or explain how you got your answer.

Mark your answer to multiple-choice question 11 in the space provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

- 11 Two car rental companies charge a one-time fee and a mileage rate for renting a car. The graph below compares the costs for renting cars from the two companies.



Based on the graph, which of the following statements appears to be true about the costs of renting cars from the two companies?

- A. The one-time fee at both companies is the same.
- B. The mileage rate at both companies is the same.
- C. Company P charges a lower one-time fee than Company Q.
- D. Company Q charges a lower mileage rate than Company P.

Mathematics

SESSION 2

You may use your reference sheet and MCAS ruler during this session.

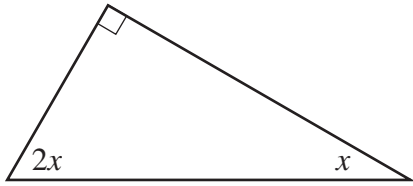
You may use a calculator during this session.



DIRECTIONS

This session contains seven multiple-choice questions, two short-answer questions, and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 12 A right triangle is shown below.



Based on the measures in the triangle, what is x ?

- A. 15°
- B. 30°
- C. 45°
- D. 60°

- 13 The expression below represents Brianna's age in terms of m , Molly's age.

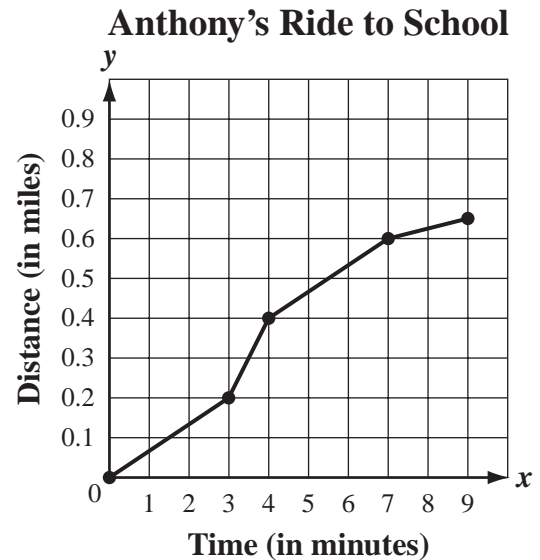
$$3m - 5$$

Which of the following statements must be true?

- A. Brianna's age is 3 less than 5 times Molly's age.
- B. Brianna's age is 5 less than 3 times Molly's age.
- C. Molly's age is 3 less than 5 times Brianna's age.
- D. Molly's age is 5 less than 3 times Brianna's age.

- 14 Two triangles have the same area. The base length of the first triangle is 2 times the base length of the second triangle.
- Which of the following statements correctly compares the heights of the two triangles?
- A. The height of the first triangle is $\frac{1}{2}$ the height of the second triangle.
 - B. The height of the first triangle is 2 times the height of the second triangle.
 - C. The height of the first triangle is $\frac{1}{4}$ the height of the second triangle.
 - D. The height of the first triangle is 4 times the height of the second triangle.

- 15 Anthony rode his bicycle from his home to school. The graph below shows the distance, in miles, that Anthony rode over time.

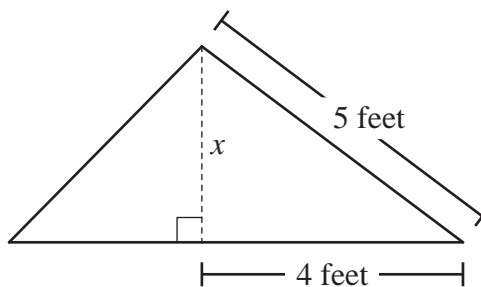


During which time interval was Anthony riding his bicycle at the greatest speed?

- A. between minute 0 and minute 3 of the ride
- B. between minute 3 and minute 4 of the ride
- C. between minute 4 and minute 7 of the ride
- D. between minute 7 and minute 9 of the ride

Question 16 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

- 16 A triangle and some of its dimensions are shown in the diagram below.



Based on the dimensions in the diagram, what is x , the height in feet of the triangle?

Mark your answer to multiple-choice question 17 in the space provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

- 17 As shown in the box below, a baseball player's batting average is calculated by dividing the total number of the player's hits by the total number of times the player was at bat.

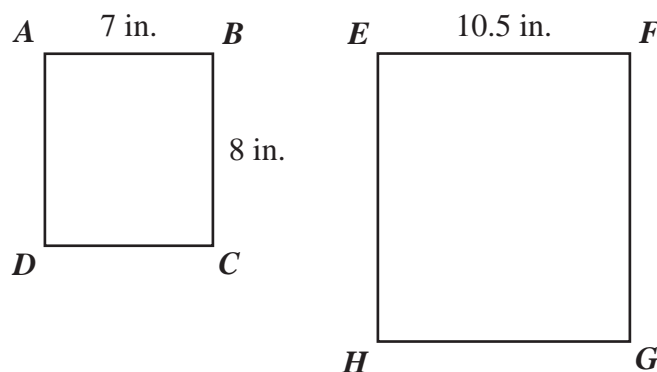
$$\text{batting average} = \frac{\text{total number of hits}}{\text{total number of times at bat}}$$

Donald was at bat a total of 120 times last season. If his batting average was 0.250, what was his total number of hits last season?

- A. 12
- B. 25
- C. 30
- D. 48

Question 18 is a short-answer question. Write your answer to this question in the box provided in your Student Answer Booklet. Do not write your answer in this test booklet. You may do your figuring in the test booklet.

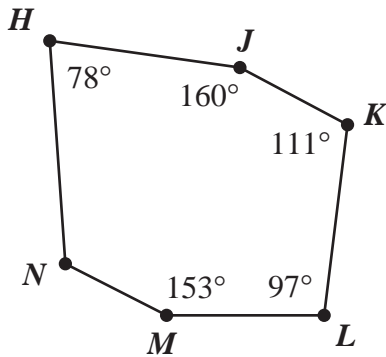
- 18 Rectangle $ABCD$ is similar to rectangle $EFGH$. The rectangles and some of their dimensions are shown in the diagram below.



Based on the diagram, what is the length, in inches, of side FG ?

Mark your answers to multiple-choice questions 19 and 20 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 19 A hexagon and the measures of some of its angles are shown below.



What is the measure of $\angle N$?

- A. 129°
- B. 121°
- C. 111°
- D. 102°

- 20 Kareema earned \$22.50 for 3 hours of baby-sitting. At this rate, which equation can be used to find y , the amount of money Kareema will earn for x hours of baby-sitting?

- A. $y = -3x + 22.50$
- B. $y = 3x + \frac{22.50}{3}$
- C. $y = 3(22.50)x$
- D. $y = \frac{22.50}{3}x$

Question 21 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

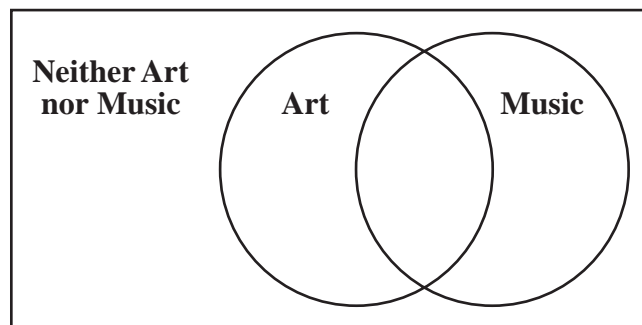
Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21** The students at Smithfield Middle School are enrolled in Art, Music, both Art and Music, or neither Art nor Music.

- A total of 88 students are enrolled in both Art and Music.
 - A total of 194 students are enrolled in Art.
 - A total of 143 students are enrolled in Music.
 - There are a total of 351 students at the school.
- a. What is the number of students who are enrolled in Music but not in Art? Show or explain how you got your answer.

In your Student Answer Booklet, copy the Venn diagram below.

Art and Music Enrollment



- b. Use the information given above to complete the Venn diagram you copied.
- c. What is the number of students who are enrolled in neither Art nor Music? Show or explain how you got your answer.

PERIMETER FORMULAS

square $P = 4s$

rectangle $P = 2b + 2h$

OR

$$P = 2l + 2w$$

triangle $P = a + b + c$

AREA FORMULAS

square $A = s^2$

rectangle $A = bh$

OR

$$A = lw$$

parallelogram $A = bh$

triangle $A = \frac{1}{2}bh$

trapezoid $A = \frac{1}{2}h(b_1 + b_2)$

circle $A = \pi r^2$

TOTAL SURFACE AREA FORMULAS

rectangular prism . . $SA = 2(lw) + 2(hw) + 2(lh)$

cylinder $SA = 2\pi r^2 + 2\pi rh$

sphere $SA = 4\pi r^2$

VOLUME FORMULAS

rectangular prism $V = lwh$

OR

$$V = Bh$$

(B = area of a base)

cube $V = s^3$
(s = length of an edge)

cylinder $V = \pi r^2 h$

sphere $V = \frac{4}{3}\pi r^3$

CIRCLE FORMULAS

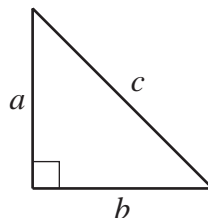
$$C = 2\pi r$$

OR

$$C = \pi d$$

$$A = \pi r^2$$

PYTHAGOREAN THEOREM



$$a^2 + b^2 = c^2$$

Grade 8 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	224	<i>Patterns, Relations, and Algebra</i>	8.P.9	A
2	224	<i>Number Sense and Operations</i>	8.N.8	A
3	224	<i>Patterns, Relations, and Algebra</i>	8.P.1	B
4	225	<i>Geometry</i>	8.G.2	A
5	225	<i>Patterns, Relations, and Algebra</i>	8.P.10	A
6	226	<i>Number Sense and Operations</i>	8.N.4	B
7	226	<i>Geometry</i>	8.G.3	B
8	227	<i>Patterns, Relations, and Algebra</i>	8.P.10	C
9	228	<i>Patterns, Relations, and Algebra</i>	8.P.7	2 pounds
10	229	<i>Number Sense and Operations</i>	8.N.12	
11	230	<i>Patterns, Relations, and Algebra</i>	8.P.10	B
12	231	<i>Geometry</i>	8.G.1	B
13	231	<i>Patterns, Relations, and Algebra</i>	8.P.4	B
14	232	<i>Patterns, Relations, and Algebra</i>	8.P.8	A
15	232	<i>Patterns, Relations, and Algebra</i>	8.P.5	B
16	233	<i>Geometry</i>	8.G.4	3 feet
17	234	<i>Number Sense and Operations</i>	8.N.12	C
18	235	<i>Measurement</i>	8.M.4	12 inches
19	236	<i>Geometry</i>	8.G.1	B
20	236	<i>Patterns, Relations, and Algebra</i>	8.P.9	D
21	237	<i>Data Analysis, Statistics, and Probability</i>	8.D.2	

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

Grade 8 Mathematics
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards

Item No.	Reporting Category	Standard
22	<i>Number Sense and Operations</i>	8.N.9
23	<i>Data Analysis, Statistics, and Probability</i>	8.D.2
24	<i>Patterns, Relations, and Algebra</i>	8.P.6
25	<i>Patterns, Relations, and Algebra</i>	8.P.1
26	<i>Geometry</i>	8.G.6
27	<i>Number Sense and Operations</i>	8.N.6
28	<i>Number Sense and Operations</i>	8.N.7
29	<i>Number Sense and Operations</i>	8.N.2
30	<i>Patterns, Relations, and Algebra</i>	8.P.5
31	<i>Patterns, Relations, and Algebra</i>	8.P.7
32	<i>Number Sense and Operations</i>	8.N.3
33	<i>Patterns, Relations, and Algebra</i>	8.P.8
34	<i>Geometry</i>	8.G.4
35	<i>Data Analysis, Statistics, and Probability</i>	8.D.2
36	<i>Number Sense and Operations</i>	8.N.3
37	<i>Data Analysis, Statistics, and Probability</i>	8.D.2
38	<i>Data Analysis, Statistics, and Probability</i>	8.D.2
39	<i>Number Sense and Operations</i>	8.N.1
40	<i>Measurement</i>	8.M.3
41	<i>Patterns, Relations, and Algebra</i>	8.P.4
42	<i>Geometry</i>	8.G.2

XV. Mathematics, Grade 10

Grade 10 Mathematics Test

The spring 2012 grade 10 Mathematics test was based on learning standards in the five major content strands in the Massachusetts *Mathematics Curriculum Framework* (2000) listed below.

- Number Sense and Operations
- Patterns, Relations, and Algebra
- Geometry
- Measurement
- Data Analysis, Statistics, and Probability

The grades 9–10 learning standards for each of these strands appear on pages 72–75 of the *Mathematics Curriculum Framework*, which is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Mathematics test results are reported under five MCAS reporting categories, which are identical to the five framework content strands listed above.

Test Sessions

The grade 10 Mathematics test included two separate test sessions, which were administered on consecutive days. Each session included multiple-choice and open-response questions. Session 1 also included short-answer questions.

Reference Materials and Tools

Each student taking the grade 10 Mathematics test was provided with a grade 10 Mathematics Reference Sheet. A copy of the reference sheet follows the final question in this chapter.

During session 2, each student had sole access to a calculator with at least four functions and a square root key. Calculator use was not allowed during session 1.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Mathematics test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The table at the conclusion of this chapter indicates each item's reporting category and the framework learning standard it assesses. The correct answers for multiple-choice and short-answer questions are also displayed in the table.

Mathematics

SESSION 1

*You may use your reference sheet during this session.
You may **not** use a calculator during this session.*



DIRECTIONS

This session contains fourteen multiple-choice questions, four short-answer questions, and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 Which of the following is equivalent to the expression below?

$$12(y + 89)$$

- A. $12(89y)$
- B. $(12 \cdot 89) + y$
- C. $(12 \cdot y) + 89$
- D. $(12 \cdot y) + (12 \cdot 89)$

- 2 Dev made a list of numbers, as shown in the box below.

4, 7, 9, 11, 13, 28

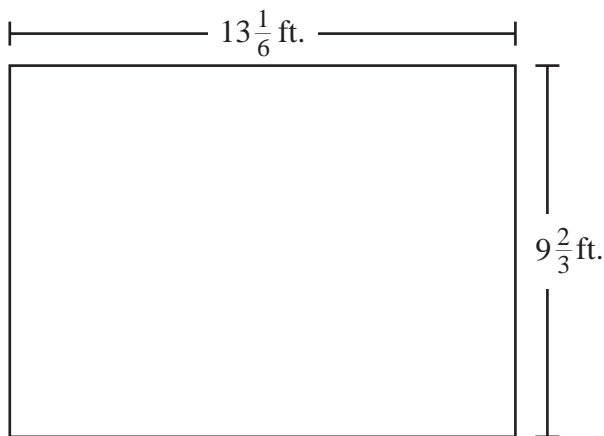
Pierre made a different list of numbers by multiplying each number from Dev's list by 2. What is the median of Pierre's list?

- A. 18
- B. 20
- C. 22
- D. 24

- 3 Points $(-2, 4)$ and $(-1, 1)$ lie on the same line. Which of the following equations represents the line?

A. $y - 1 = -\frac{1}{3}(x + 1)$
B. $y - 1 = -3(x + 1)$
C. $y - 1 = -\frac{1}{3}(x - 1)$
D. $y - 1 = -3(x - 1)$

- 4 A contractor will use tiles to cover the floor represented by the rectangle below.



Each tile covers one square foot and costs \$2.49.

Which of the following is closest to the total cost of the tiles needed to cover the entire floor?

A. \$100
B. \$234
C. \$250
D. \$320

- 5 What is the value of the expression below?

$$240 \div 2^3 \cdot 10 - 20$$

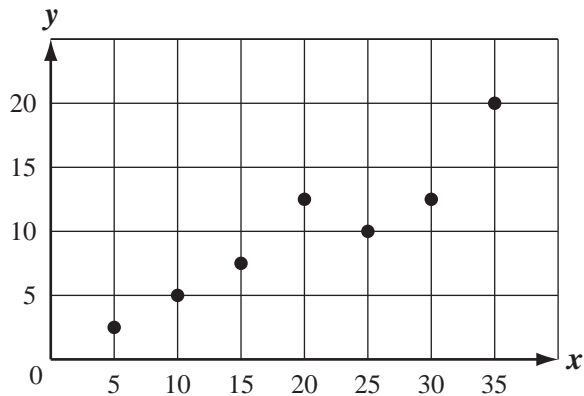
A. 10
B. 40
C. 280
D. 380

- 6 What are the solutions of the equation below?

$$5x(x + 8) = 0$$

A. $x = -5$; $x = -8$
B. $x = 0$; $x = -8$
C. $x = 0$; $x = 8$
D. $x = 5$; $x = 8$

- 7 Which of the following is closest to the slope of the line of best fit for the scatterplot below?



- A. $\frac{1}{2}$
 B. $-\frac{1}{2}$
 C. $\frac{2}{1}$
 D. $-\frac{2}{1}$

- 8 What is the solution of the system of equations below?

$$3x + 2y = 5$$

$$2x + y = 2$$

- A. $x = 2$; $y = -2$
 B. $x = -2$; $y = 6$
 C. $x = 1$; $y = 1$
 D. $x = -1$; $y = 4$

- 9 Which of the following is closest to $\sqrt{50}$?

- A. 6.4
 B. 6.8
 C. 7.1
 D. 7.5

- 10 Manuel typed a total of 2974 words in 51 minutes.

Which of the following is closest to the number of words he typed per minute?

- A. 20
 B. 40
 C. 60
 D. 100

- 11 The table below shows a linear relationship between the values of x and y .

x	y
2	7
0	3
-2	-1
-4	-5

Which of the following equations represents the relationship shown in the table?

- A. $y = 2x + 3$
- B. $y = 7x - 4$
- C. $y = x + 3$
- D. $y = x - 1$

- 12 What is the value of the expression below?

$$\sqrt[3]{8^2}$$

- A. $\frac{64}{3}$
- B. 8
- C. $\frac{16}{3}$
- D. 4

- 13 A ball is rolled off a ledge that is 100 meters above the ground. The height of the ball, in meters, can be calculated by using the formula below.

$$\text{height} = 100 - \frac{1}{2}(9.8)t^2$$

In the formula, t is the total elapsed time, in seconds, since the ball was rolled off the ledge.

What is the height of the ball after 3 seconds?

- A. 29.4 meters
- B. 44.1 meters
- C. 55.9 meters
- D. 70.6 meters

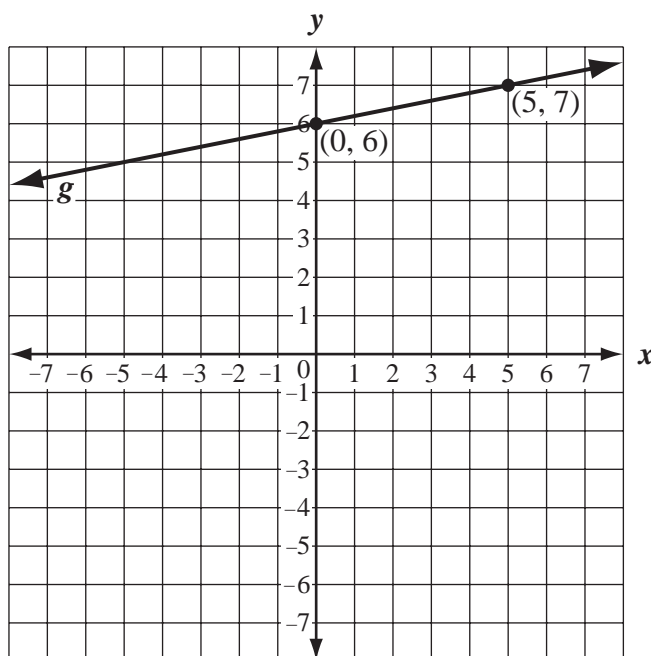
- 14 Which of the following is equivalent to the expression below?

$$6x - 3 - 4x + 8$$

- A. $6x + 1$
- B. $3x + 4$
- C. $2x + 5$
- D. $10x + 11$

Questions 15 and 16 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 15 Line g is shown on the graph below.



What is the slope of line g ?

- 16 What value of b makes the equation below true?

$$\frac{5}{3}b = 1$$

Question 17 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

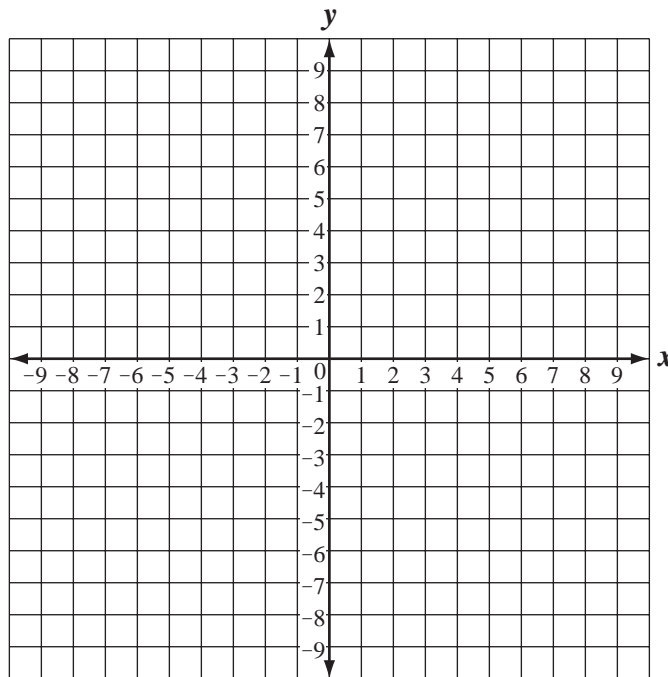
Write your answer to question 17 in the space provided in your Student Answer Booklet.

- 17** Line n is represented by the equation below.

$$y = \frac{4}{3}x + 4$$

- What is the slope of line n ? Show or explain how you got your answer.
- What is the y -intercept of line n ? Show or explain how you got your answer.
- What is the x -intercept of line n ? Show or explain how you got your answer.

A coordinate plane is shown below. Copy the axes and the labels of the coordinate plane exactly as shown onto the grid in your Student Answer Booklet.



- On the coordinate plane you copied into your Student Answer Booklet, graph line n .
- Write an equation of the line that has the same **x -intercept** as line n and a slope of -2 . Show or explain how you got your answer.

Questions 18 and 19 are short-answer questions. Write your answers to these questions in the boxes provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 18** What is the value of the expression below?

$$(\sqrt{5})^4$$

- 19** What is the value of x that makes the equation below true?

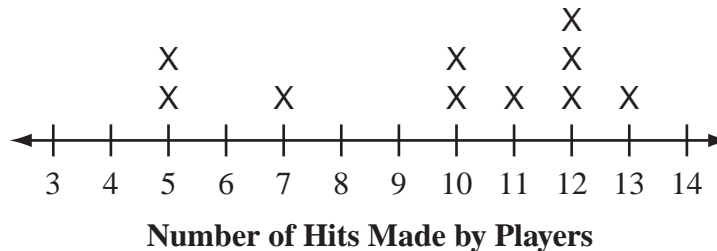
$$x - 20 = -3(x - 4)$$

Questions 20 and 21 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 20 in the space provided in your Student Answer Booklet.

- 20** The line plot below shows the number of hits made by each of 10 players on a baseball team during batting practice.



- What was the mode of the numbers of hits made by the players? Show or explain how you got your answer.
- What was the median number of hits made by the players? Show or explain how you got your answer.
- What was the mean number of hits made by the players? Show or explain how you got your answer.

Two additional players arrived at practice. The number of hits made by each additional player was included in the line plot with the following results:

- The median number of hits increased.
 - The mode of the numbers of hits remained the same.
- What could be the number of hits made by **each** of the two additional players? Show or explain how you got your answer.

Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21 Kim and Sean are playing a mathematics card game for extra credit. Each card in the game has an expression written on it. Kim's first card is shown below.

$$\frac{3 + 2}{6 - 1}$$

- a. What is the value of the expression on Kim's first card? Show or explain how you got your answer.

Sean's first card is shown below.

$$-6 - |3 - (-8)|$$

- b. What is the value of the expression on Sean's first card? Show or explain how you got your answer.

For Kim to earn extra credit from the game, she must select a second card that has an expression with a value that is exactly twice the value of the expression on her first card.

- c. Which of the following cards shows an expression with a value that is exactly twice the value of the expression on Kim's card? Show or explain how you got your answer.

$$|-5 - (-3)|$$

$$|-5 - 3|$$

Sean's second card is shown below.

$$-10 + 10 - 20$$

For Sean to earn extra credit from the game, he **must** insert one set of absolute value bars in the expression so that the value of the expression is a negative integer.

- d. If Sean inserts the set of absolute value bars correctly, what is one possible value of the expression on Sean's second card? Show or explain how you got your answer.

Mathematics

SESSION 2

You may use your reference sheet during this session.

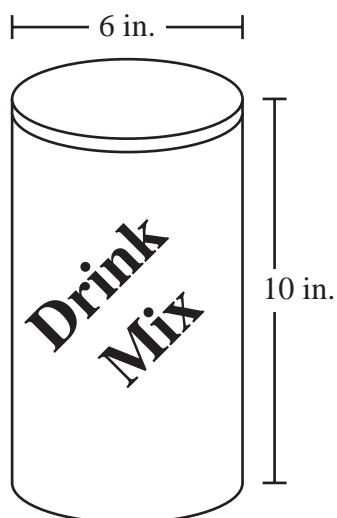
You may use a calculator during this session.



DIRECTIONS

This session contains eighteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

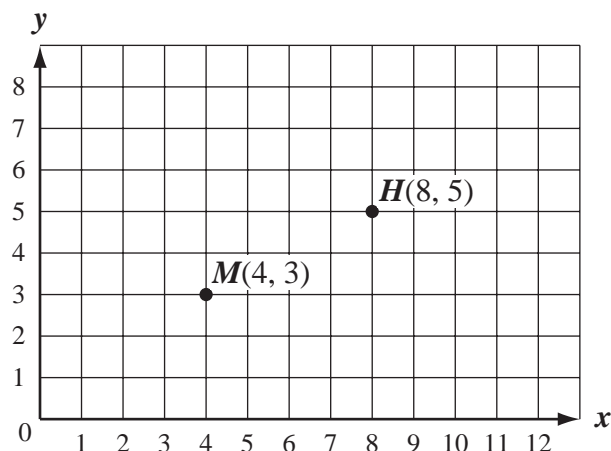
- 22 A powdered drink mix container is in the shape of a right circular cylinder. The dimensions of the container are shown below.



Which of the following is closest to the volume of the container?

- A. 188 cubic inches
- B. 283 cubic inches
- C. 471 cubic inches
- D. 1131 cubic inches

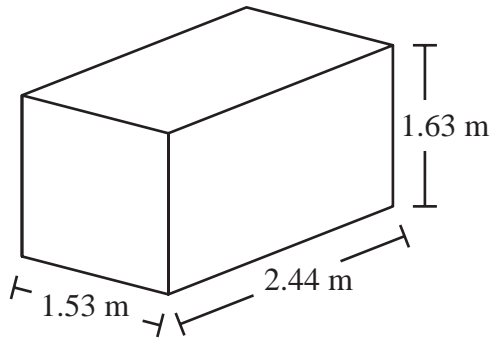
- 23 Points M and H are shown on the coordinate grid below.



Point M is the midpoint of \overline{GH} . What are the coordinates of point G ?

- A. (0, 1)
- B. (2, 1)
- C. (4, 2)
- D. (12, 7)

- 24 A shipping container is in the shape of a rectangular prism. The dimensions of the shipping container are shown in the diagram below.

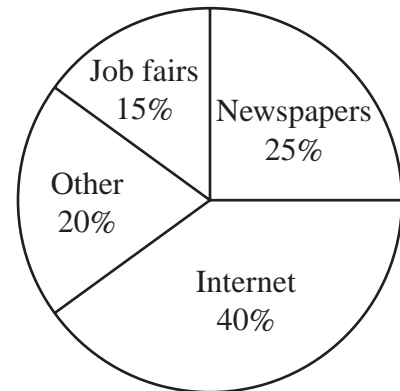


Which of the following is closest to the total surface area of the container?

- A. 6.09 m^2
- B. 10.20 m^2
- C. 12.94 m^2
- D. 20.41 m^2

- 25 Gina surveyed a group of people about what search method each used most often to find a job. The circle graph below represents their answers to her survey.

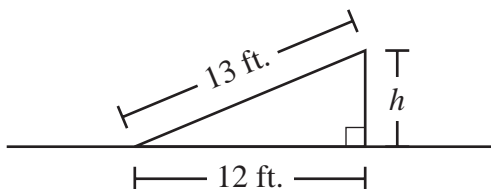
**Job Search Methods
Used Most Often**



There were 32 people who answered that they used the Internet most often. What was the total number of people that Gina surveyed?

- A. 40
- B. 80
- C. 92
- D. 128

- 26 The diagram below represents a ramp and some of its dimensions.



What is the height, h , of the ramp?

- A. 1 ft.
- B. 5 ft.
- C. 8 ft.
- D. 25 ft.

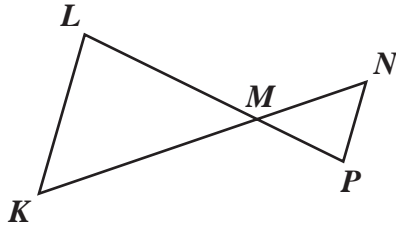
- 27 The first five terms in a quadratic pattern are shown below.

$-0.4, -1.6, -3.6, -6.4, -10.0, \dots$

What is the next term in the pattern?

- A. -11.2
- B. -13.6
- C. -14.4
- D. -16.4

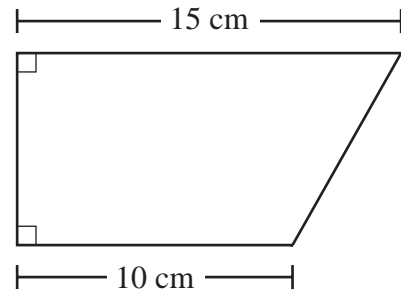
- 28 In the diagram below, $\triangle LMK \sim \triangle PMN$.



Based on the relationship between the triangles, which of the following proportions is true?

- A. $\frac{LM}{PM} = \frac{KL}{NP}$
 B. $\frac{LM}{PM} = \frac{NP}{KL}$
 C. $\frac{MK}{MP} = \frac{KL}{NP}$
 D. $\frac{MK}{MP} = \frac{NP}{KL}$

- 29 A trapezoid and some of its dimensions are shown below.

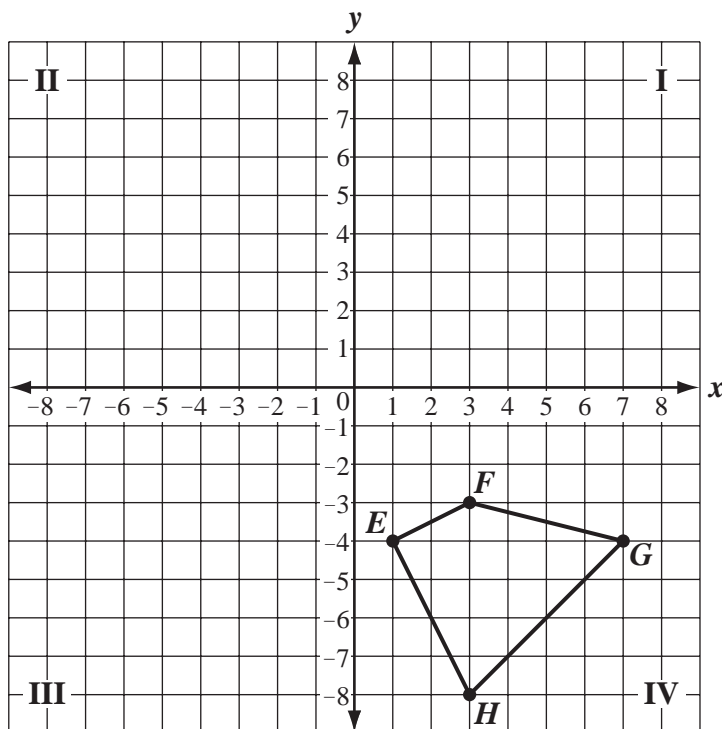


The area of the trapezoid is 100 square centimeters.

What is the height of the trapezoid?

- A. 2 cm
 B. 4 cm
 C. 8 cm
 D. 10 cm

- 30 Quadrilateral $EFGH$ is shown on the coordinate grid below.



The quadrilateral will be reflected over the y -axis. The **reflected** image will then be translated 2 units left and 7 units up. In which of the following quadrants will the final reflected and translated image lie?

- A. I and II
- B. II and III
- C. II and IV
- D. III and IV

Question 31 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 31 in the space provided in your Student Answer Booklet.

- 31** The ages, in years, of the 11 reporters who work at a newspaper are listed below.

28, 45, 61, 40, 55, 58, 33, 27, 35, 33, 46
--

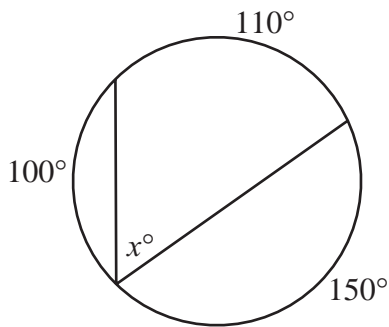
- In your Student Answer Booklet, make a stem-and-leaf plot of the reporters' ages. Be sure to include a title and a key for your plot.
- What is the range of the ages, in years, of the reporters? Show or explain how you got your answer.
- What is the median age, in years, of the reporters? Show or explain how you got your answer.

The newspaper hired a new reporter. When the age of the new reporter was included in the stem-and-leaf plot, the range increased by 4 years.

- What is one possible **median** age that could result from including the new reporter's age in the stem-and-leaf plot? Show or explain how you got your answer.

Mark your answers to multiple-choice questions 32 through 40 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet. You may do your figuring in the test booklet.

- 32** An angle is inscribed in a circle, as shown below.

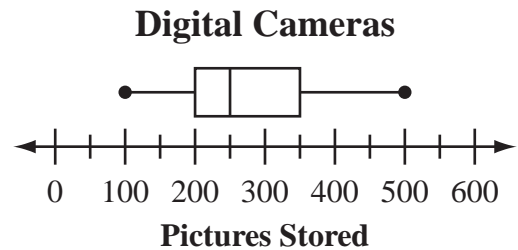


The degree measures of three arcs are shown in the diagram.

What is the value of x ?

- A. 55
- B. 70
- C. 75
- D. 110

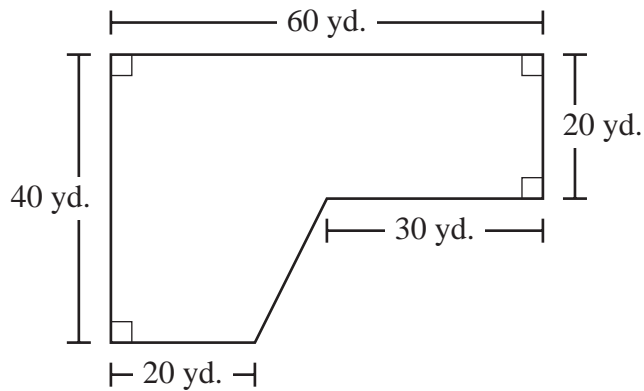
- 33** The box-and-whisker plot below shows the numbers of pictures that can be stored on different digital cameras.



What is the median number of pictures that can be stored?

- A. 250
- B. 300
- C. 350
- D. 400

- 34 Some of the dimensions of a driveway are shown in the diagram below.



What is the area of the driveway?

- A. 1600 sq. yd.
- B. 1700 sq. yd.
- C. 2200 sq. yd.
- D. 2400 sq. yd.

- 35 A painting job can be completed in 12 hours by 3 professional painters. The same job can be completed in 6 hours by 6 professional painters. All professional painters paint at the same rate.

What is the total amount of time it would take 9 professional painters to complete the same painting job?

- A. 2 hours
- B. 4 hours
- C. 5 hours
- D. 8 hours

- 36 A circular dinner plate has a radius $\frac{3}{2}$ times the radius of a circular salad plate.

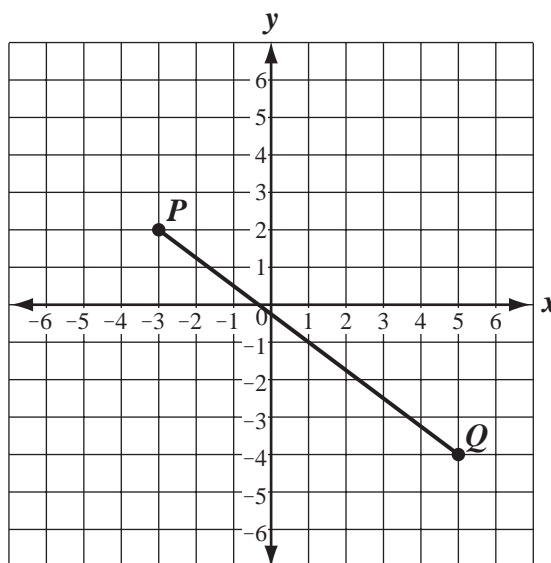
The area of the dinner plate is how many times the area of the salad plate?

- A. $\frac{3}{2}$
- B. $\frac{9}{4}$
- C. $\frac{3}{1}$
- D. $\frac{9}{2}$

- 37 Which of the following could **not** be the exact number of right angles in a quadrilateral?

- A. 1
- B. 2
- C. 3
- D. 4

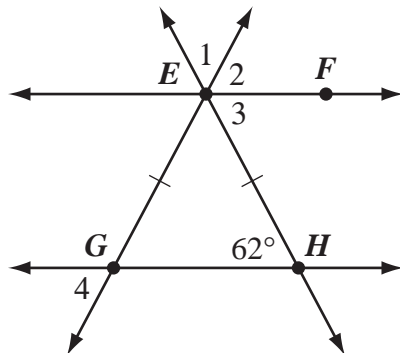
- 38 Point P and point Q are shown on the coordinate grid below.



Which of the following best represents the length of \overline{PQ} ?

- A. 5 units
- B. 6 units
- C. 10 units
- D. 14 units

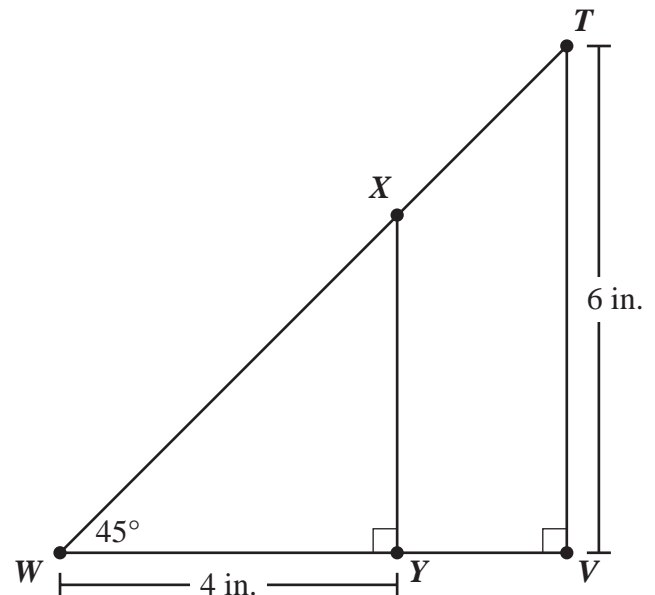
- 39 In the diagram below, $\overleftrightarrow{EF} \parallel \overleftrightarrow{GH}$ and $\overline{EG} \cong \overline{EH}$.



Based on the angle measure in the diagram, which of the following angles does **not** have a measure of 62° ?

- A. $\angle 1$
- B. $\angle 2$
- C. $\angle 3$
- D. $\angle 4$

- 40 In the diagram below, $\triangle TWV \sim \triangle XWY$.



Based on the dimensions shown, what is the length of \overline{TX} ?

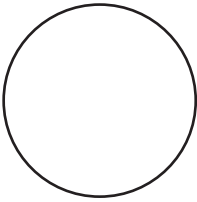
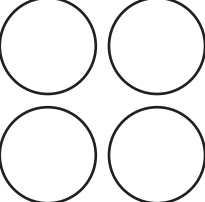
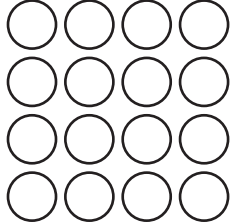
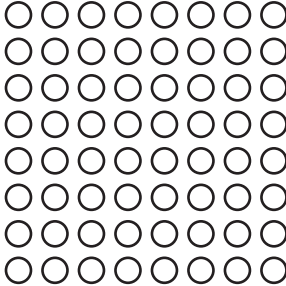
- A. $2\sqrt{2}$ inches
- B. $4\sqrt{2}$ inches
- C. $6\sqrt{2}$ inches
- D. $10\sqrt{2}$ inches

Questions 41 and 42 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 41 in the space provided in your Student Answer Booklet.

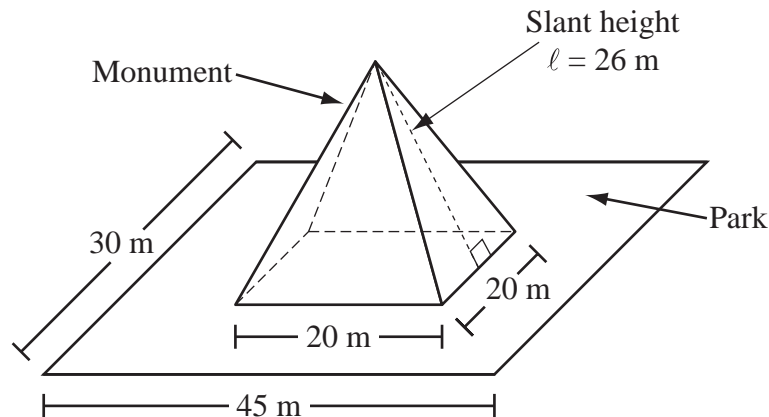
- 41** The table below shows figures composed of circles. The number of circles in each figure and the diameter of each circle in each figure follow a pattern, as shown.

	Figure 1	Figure 2	Figure 3	Figure 4
				
Number of Circles	1	4	16	64
Diameter of Each Circle (in inches)	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$

- a. What is the number of circles in figure 5? Show or explain how you got your answer.
- b. What is the diameter, in inches, of each circle in figure 5? Show or explain how you got your answer.
- c. What is the ratio of the number of circles in figure 6 to the number of circles in figure 7? Show or explain how you got your answer.
- d. Write an algebraic expression that could be used to determine the number of circles in figure n .
- e. Write an algebraic expression that could be used to determine the diameter, in inches, of each circle in figure n .

Write your answer to question 42 in the space provided in your Student Answer Booklet.

- 42 A monument in the shape of a right square pyramid is located in a park. The park is in the shape of a rectangle. The measurements of the monument and the park are shown in the diagram below.



- What is the area, in square meters, of the base of the monument? Show or explain how you got your answer.
- What is the area, in square meters, of the park, **not** including the base of the monument? Show or explain how you got your answer.
- What is the lateral surface area, in square meters, of the monument? Show or explain how you got your answer.

The height of the monument is 24 meters.

- What is the volume, in cubic meters, of the monument? Show or explain how you got your answer.

AREA FORMULAS

square $A = s^2$

rectangle $A = bh$

parallelogram $A = bh$

triangle $A = \frac{1}{2}bh$

trapezoid $A = \frac{1}{2}h(b_1 + b_2)$

circle $A = \pi r^2$

LATERAL SURFACE AREA FORMULAS

right rectangular prism $LA = 2(hw) + 2(lh)$

right circular cylinder $LA = 2\pi rh$

right circular cone $LA = \pi r\ell$
(ℓ = slant height)

right square pyramid $LA = 2s\ell$
(ℓ = slant height)

TOTAL SURFACE AREA FORMULAS

cube $SA = 6s^2$

right rectangular prism $SA = 2(lw) + 2(hw) + 2(lh)$

sphere $SA = 4\pi r^2$

right circular cylinder $SA = 2\pi r^2 + 2\pi rh$

right circular cone $SA = \pi r^2 + \pi r\ell$
(ℓ = slant height)

right square pyramid $SA = s^2 + 2s\ell$
(ℓ = slant height)

VOLUME FORMULAS

cube $V = s^3$
(s = length of an edge)

right rectangular prism $V = lwh$

OR

$V = Bh$
(B = area of a base)

sphere $V = \frac{4}{3}\pi r^3$

right circular cylinder $V = \pi r^2 h$

right circular cone $V = \frac{1}{3}\pi r^2 h$

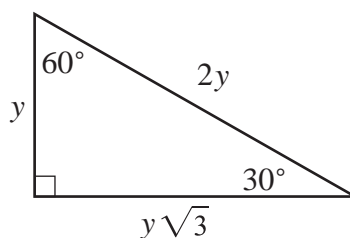
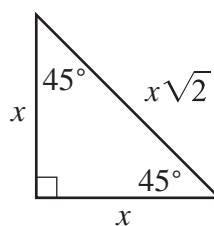
right square pyramid $V = \frac{1}{3}s^2 h$

CIRCLE FORMULAS

$C = 2\pi r$

$A = \pi r^2$

SPECIAL RIGHT TRIANGLES



Grade 10 Mathematics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC/SA)*
1	251	<i>Number Sense and Operations</i>	10.N.1	D
2	251	<i>Data Analysis, Statistics, and Probability</i>	10.D.1	B
3	252	<i>Patterns, Relations, and Algebra</i>	10.P.2	B
4	252	<i>Number Sense and Operations</i>	10.N.4	D
5	252	<i>Number Sense and Operations</i>	10.N.2	C
6	252	<i>Patterns, Relations, and Algebra</i>	10.P.5	B
7	253	<i>Data Analysis, Statistics, and Probability</i>	10.D.2	A
8	253	<i>Patterns, Relations, and Algebra</i>	10.P.8	D
9	253	<i>Number Sense and Operations</i>	10.N.3	C
10	253	<i>Number Sense and Operations</i>	10.N.4	C
11	254	<i>Patterns, Relations, and Algebra</i>	10.P.1	A
12	254	<i>Number Sense and Operations</i>	10.N.1	D
13	254	<i>Patterns, Relations, and Algebra</i>	10.P.7	C
14	254	<i>Patterns, Relations, and Algebra</i>	10.P.4	C
15	255	<i>Patterns, Relations, and Algebra</i>	10.P.2	$\frac{1}{5}$
16	255	<i>Number Sense and Operations</i>	10.N.1	$\frac{3}{5}$
17	256	<i>Patterns, Relations, and Algebra</i>	10.P.2	
18	257	<i>Number Sense and Operations</i>	10.N.1	25
19	257	<i>Patterns, Relations, and Algebra</i>	10.P.6	$x = 8$
20	258	<i>Data Analysis, Statistics, and Probability</i>	10.D.1	
21	259	<i>Number Sense and Operations</i>	10.N.2	
22	260	<i>Measurement</i>	10.M.2	B
23	260	<i>Geometry</i>	10.G.7	A
24	261	<i>Measurement</i>	10.M.2	D
25	261	<i>Data Analysis, Statistics, and Probability</i>	10.D.1	B
26	262	<i>Geometry</i>	10.G.5	B
27	262	<i>Patterns, Relations, and Algebra</i>	10.P.1	C
28	263	<i>Geometry</i>	10.G.4	A
29	263	<i>Measurement</i>	10.M.1	C
30	264	<i>Geometry</i>	10.G.9	B
31	265	<i>Data Analysis, Statistics, and Probability</i>	10.D.1	
32	266	<i>Geometry</i>	10.G.3	A
33	266	<i>Data Analysis, Statistics, and Probability</i>	10.D.1	A
34	267	<i>Measurement</i>	10.M.1	B
35	267	<i>Patterns, Relations, and Algebra</i>	10.P.7	B
36	268	<i>Measurement</i>	10.M.3	B
37	268	<i>Geometry</i>	10.G.1	C
38	268	<i>Geometry</i>	10.G.5	C
39	269	<i>Geometry</i>	10.G.3	A
40	269	<i>Geometry</i>	10.G.6	A
41	270	<i>Patterns, Relations, and Algebra</i>	10.P.1	
42	271	<i>Measurement</i>	10.M.2	

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

XVI. Science and Technology/Engineering, Grade 5

Grade 5 Science and Technology/Engineering Test

The spring 2012 grade 5 Science and Technology/Engineering test was based on learning standards in the four major content strands in the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006) listed below. Page numbers for the grades 3–5 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 26–29)
- Life Science (Biology) (*Framework*, pages 46–49)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 64–66)
- Technology/Engineering (*Framework*, page 86)

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four framework content strands listed above.

Test Sessions

The grade 5 Science and Technology/Engineering test included two separate test sessions. Each session included multiple-choice and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Science and Technology/Engineering test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

Science and Technology/Engineering

SESSION 1

DIRECTIONS

This session contains six multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 Which of the following is a reason loggerhead turtles bury their eggs in holes that they dig on the beach?
- A. to keep the eggs covered with water
 - B. to provide the eggs with nutrients
 - C. to hide the eggs from predators
 - D. to protect the eggs from sand

- 2 The picture below shows a balloon filled with air.



A teacher carefully pops the balloon with a pin. The students pick up the pieces of the balloon and compare them.

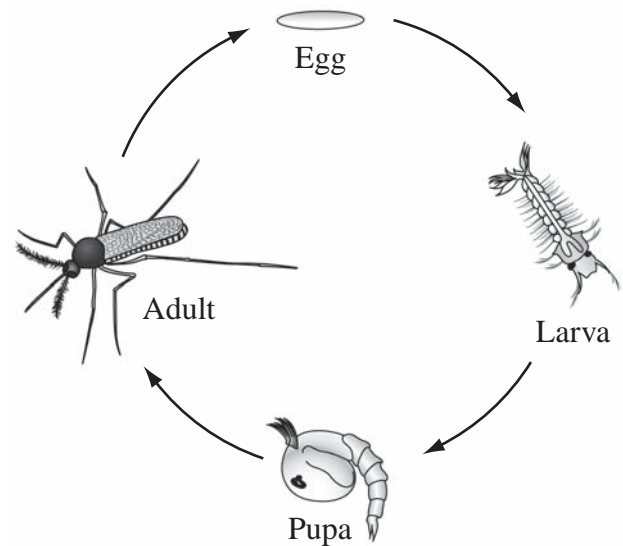
Which of the following properties of the pieces should be **most** similar?

- A. color
- B. shape
- C. size
- D. weight

3 Which of the following statements **best** describes a complex machine?

- A. It is designed to move with a motor.
- B. It is constructed from machine-made parts.
- C. It is made of more than one simple machine.
- D. It is built from more than one type of material.

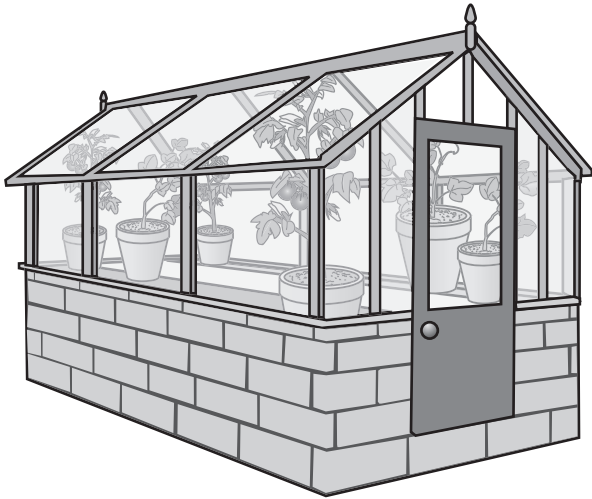
4 The diagram below shows four stages in the life cycle of the mosquito.



During which stage in its life cycle is the mosquito able to mate and reproduce?

- A. egg
- B. larva
- C. pupa
- D. adult

- 5 Carlos and his grandfather grow plants all year long in a greenhouse in Boston, Massachusetts. The picture below shows the greenhouse where they grow their plants.



This greenhouse was **most likely** built to solve which of the following problems?

- A. How do they put fertilizer in the soil?
- B. How do they give water to the plants?
- C. How do they protect the plants from weather conditions?
- D. How do they store the garden tools in an organized way?

- 6 Which of the following processes makes it possible for plants to use energy from sunlight to produce their own food?

- A. metamorphosis
- B. photosynthesis
- C. pollination
- D. reproduction

Question 7 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 7 in the space provided in your Student Answer Booklet.

- 7 The picture below shows a battery-powered electric car. The chemical energy in the battery is changed into electrical energy when the car is being driven. The electrical energy is then changed into other forms of energy in the car.



- Identify **three** parts of the car that use electrical energy.
- Describe how electrical energy changes into another form of energy in **each** part of the car you identified in part (a).

Science and Technology/Engineering

SESSION 2

DIRECTIONS

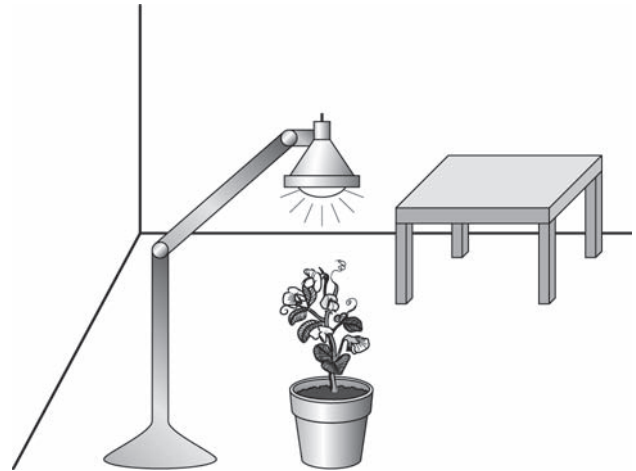
This session contains thirteen multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 8 Cameron is shopping for a new desk. He wants to make sure the desk will fit in the corner of his room.

When Cameron shops for the new desk, which of the following will **best** help him make sure that the desk will fit?

- A. a picture showing the carpet in his room
- B. a diagram of the measurements of his room
- C. a drawing showing how to put a desk together
- D. a list of tools he needs to put the desk together

- 9 The picture below shows a plant growing in a closed room under a single light.



The plant is moved to the table in the back of the room and the light remains in the same place. Which of the following will change the **most**?

- A. the direction the plant grows
- B. the nutrients the plant needs
- C. the shape of the plant's leaves
- D. the color of the plant's flowers

- 10 The table below lists some weather conditions for one day in Worcester, Massachusetts.

Wind Speed	1–2 mi. per hr
Wind Direction	north
High Temperature	82°F
Precipitation	1.0 in.

Based on the information in the table, which of the following types of precipitation **most likely** occurred on this day?

- A. hail
- B. rain
- C. sleet
- D. snow

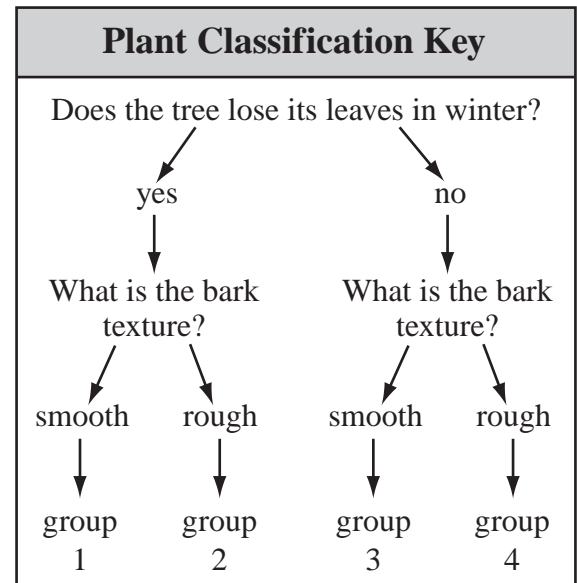
- 11 Which part of a plant is **most** responsible for using energy from the Sun to produce food for the plant?

- A. flower
- B. leaf
- C. root
- D. stem

- 12 Which of the following characteristics is a lion **least likely** to pass on to its offspring?

A. colors of its fur
B. length of its tail
C. scars on its leg
D. size of its body

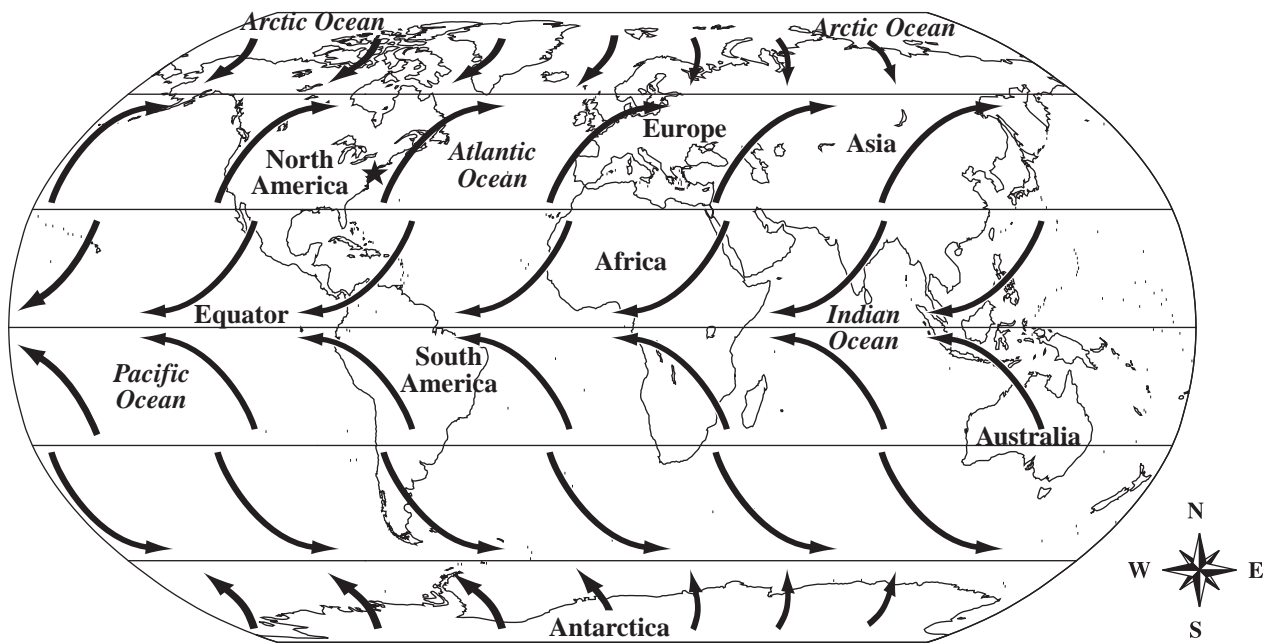
- 13 Kate is using the key shown below to classify a tree into one of four different groups.



The tree loses its leaves in winter and has rough bark. According to the key, into which group should the tree be classified?

- A. group 1
B. group 2
C. group 3
D. group 4

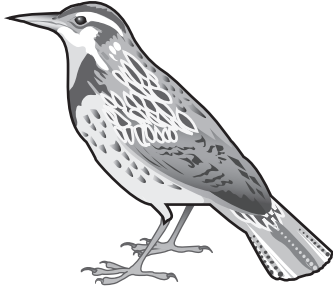
- 14 The map below shows global wind patterns. The east coast of the United States is marked with a star.



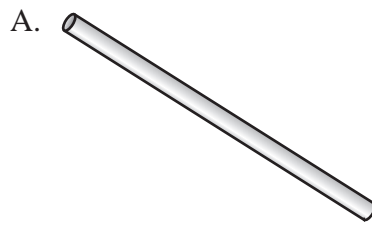
Global winds blow in the directions shown on the map. Winds blowing from the east coast of the United States have the **most** effect on the weather in which of the following regions?

- A. Africa
- B. Asia
- C. Europe
- D. South America

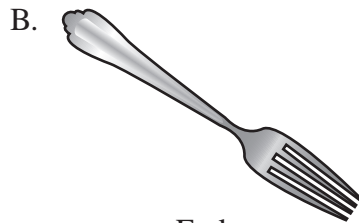
- 15 Eastern meadowlarks are birds that use their beaks to grab and remove insects from holes in trees. An eastern meadowlark is shown below.



Which of the following objects functions **most** like the meadowlark's beak?



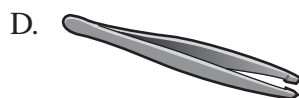
Drinking straw



Fork



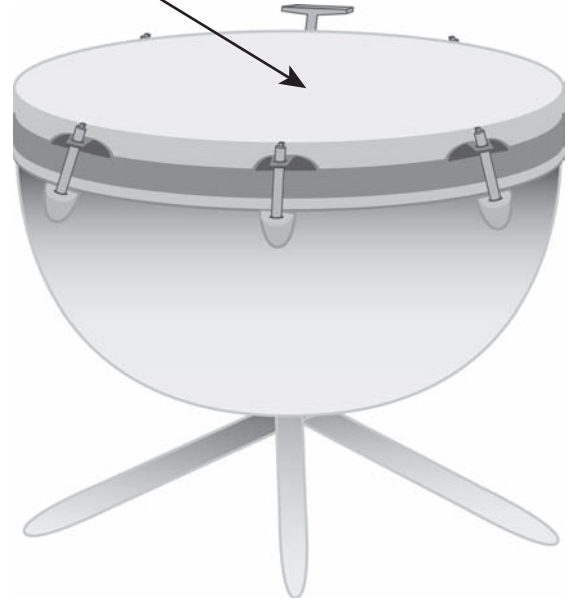
Scissors



Tweezers

- 16 The picture below shows a drum.

Drum head



What could be done to the drum head to make the drum have a higher pitch?

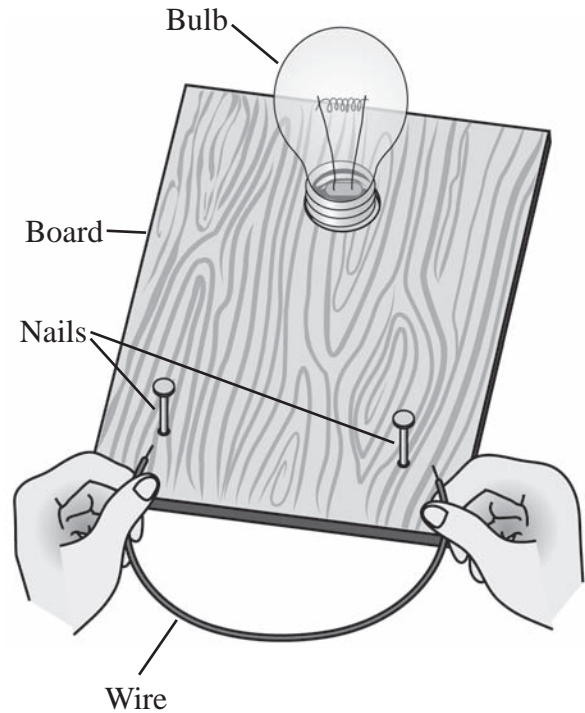
- A. Cover the drum head with a piece of plastic.
- B. Put a thicker drum head on the drum.
- C. Hit the drum head with more force.
- D. Tighten the drum head.

- 17 In some locations, squirrels sleep for long periods of time during the winter months. Which of the following **most likely** causes these squirrels to sleep for long periods of time?
- A. increase in humidity
 - B. decrease in temperature
 - C. clouds forming in the sky
 - D. winds blowing in the night
- 18 The Sun appears to move across the sky each day, rising in the east and setting in the west. What causes this apparent motion?
- A. the rotation of Earth on its axis
 - B. the revolution of the Sun around Earth
 - C. the Earth's distance from the Sun
 - D. the properties of Earth's atmosphere

- 19 A student observed a rock made up of many small particles of sand arranged in light-colored layers and dark-colored layers. Which of the following statements describes how this type of rock **most likely** formed?

A. Clay was crushed and frozen under a glacier.
B. Lava from a volcano cooled quickly in water.
C. River sediments were slowly compacted and cemented together.
D. Mineral deposits hardened into solid rock in underground caves.

- 20 The diagram below shows a project that a student made to test an electrical circuit. Part of the electrical circuit is underneath the board.



When the student connects the two nails using a wire, the bulb lights up. Which of the following **must** be underneath the board?

A. a magnet and a switch
B. a switch and some wires
C. a magnet and a power source
D. a power source and some wires

Question 21 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21** Alicia lives near the beach. She wants to plant a vegetable garden, but she knows vegetables will be difficult to grow in the sandy soil in her backyard.
- a. Describe **two** properties of sandy soil that make growing vegetables difficult.
 - b. Describe **one** thing Alicia could add to the soil to make it better for growing vegetables. Explain the reasoning for your answer.

**Grade 5 Science and Technology/Engineering
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	270	<i>Life Science</i>	10	C
2	270	<i>Physical Sciences</i>	1	A
3	271	<i>Technology/Engineering</i>	1.3	C
4	271	<i>Life Science</i>	3	D
5	272	<i>Technology/Engineering</i>	2.1	C
6	272	<i>Life Science</i>	11	B
7	273	<i>Physical Sciences</i>	5	
8	274	<i>Technology/Engineering</i>	2.2	B
9	274	<i>Life Science</i>	9	A
10	275	<i>Earth and Space Science</i>	7	B
11	275	<i>Life Science</i>	2	B
12	276	<i>Life Science</i>	5	C
13	276	<i>Life Science</i>	1	B
14	277	<i>Earth and Space Science</i>	8	C
15	278	<i>Technology/Engineering</i>	2.4	D
16	278	<i>Physical Sciences</i>	11	D
17	279	<i>Life Science</i>	8	B
18	279	<i>Earth and Space Science</i>	14	A
19	280	<i>Earth and Space Science</i>	3	C
20	280	<i>Physical Sciences</i>	6	D
21	281	<i>Earth and Space Science</i>	5	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

**Grade 5 Science and Technology/Engineering
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards**

Item No.	Reporting Category	Standard
22	<i>Life Science</i>	6
23	<i>Earth and Space Science</i>	4
24	<i>Earth and Space Science</i>	12
25	<i>Earth and Space Science</i>	11
26	<i>Life Science</i>	1
27	<i>Earth and Space Science</i>	15
28	<i>Physical Sciences</i>	8
29	<i>Life Science</i>	3
30	<i>Physical Sciences</i>	7
31	<i>Earth and Space Science</i>	4
32	<i>Earth and Space Science</i>	10
33	<i>Life Science</i>	7
34	<i>Physical Sciences</i>	4
35	<i>Physical Sciences</i>	2
36	<i>Earth and Space Science</i>	1
37	<i>Physical Sciences</i>	9
38	<i>Physical Sciences</i>	12
39	<i>Earth and Space Science</i>	9
40	<i>Life Science</i>	9
41	<i>Physical Sciences</i>	3
42	<i>Technology/Engineering</i>	2.1

XVII. Science and Technology/Engineering, Grade 8

Grade 8 Science and Technology/Engineering Test

The spring 2012 grade 8 Science and Technology/Engineering test was based on learning standards in the four major content strands in the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006) listed below. Page numbers for the grades 6–8 learning standards appear in parentheses.

- Earth and Space Science (*Framework*, pages 32–33)
- Life Science (Biology) (*Framework*, pages 51–53)
- Physical Sciences (Chemistry and Physics) (*Framework*, pages 67–68)
- Technology/Engineering (*Framework*, pages 87–89)

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Science and Technology/Engineering test results are reported under four MCAS reporting categories, which are identical to the four framework content strands listed above.

Test Sessions

The grade 8 Science and Technology/Engineering test included two separate test sessions. Each session included multiple-choice and open-response questions. Approximately half of the common test items are shown on the following pages as they appeared in test booklets.

Reference Materials and Tools

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Science and Technology/Engineering test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The tables at the conclusion of this chapter indicate each released and unreleased common item's reporting category and the framework learning standard it assesses. The correct answers for released multiple-choice questions are also displayed in the released item table.

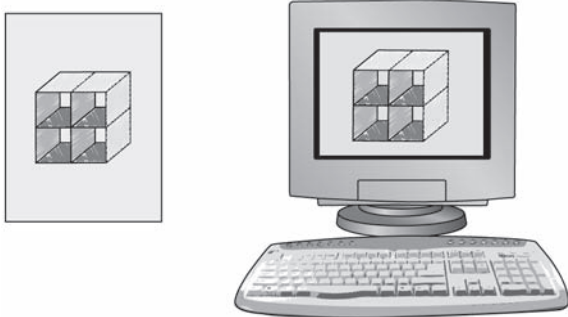
Science and Technology/Engineering

SESSION 1

DIRECTIONS

This session contains eleven multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

- 1 The pictures below show a drawing on paper and the same drawing in an electronic format on a computer screen.

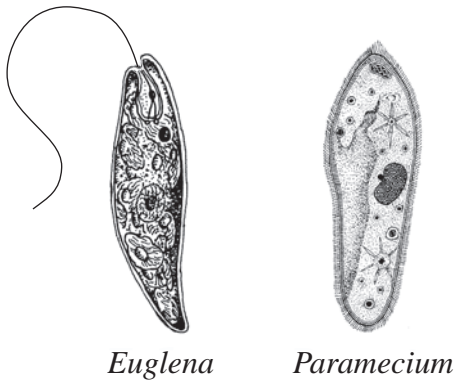


Which of the following devices was **most likely** used to convert the drawing on paper into an electronic format that could be viewed on a computer screen?

- A. Internet modem
- B. network router
- C. printer
- D. scanner

- 2 Which of the following processes usually takes the **longest** amount of time?
- A. Hot lava cools and forms new rock.
 - B. Water vapor condenses to form a cloud.
 - C. A seismic wave travels through the mantle.
 - D. An ocean basin forms between two continents.

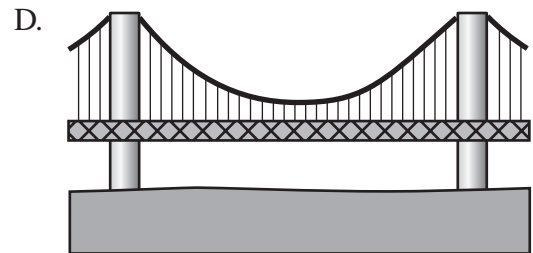
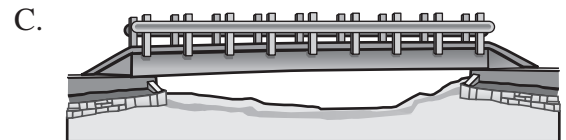
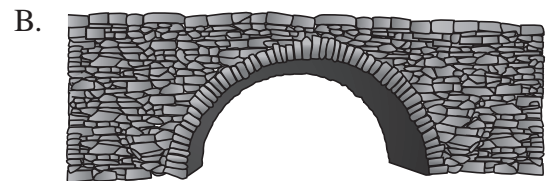
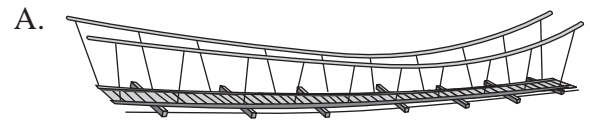
- 3 The illustration below represents two protists.



What do these two organisms have in common?

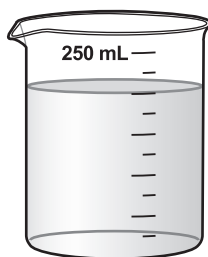
- A. They are unicellular.
- B. They cause diseases.
- C. They live underground.
- D. They are photosynthetic.

- 4 Which of the following pictures shows a beam bridge?



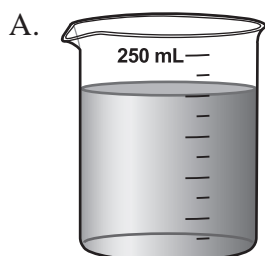
- 5 Oxygen and iron combine chemically to form rust. Rust is classified as which of the following?
- A. an atom
 - B. a compound
 - C. an element
 - D. a mixture
- 6 Heat energy from the Sun is transferred to Earth primarily by which of the following processes?
- A. conduction
 - B. convection
 - C. evaporation
 - D. radiation
- 7 Scientists found evidence of past glacial activity in Massachusetts. Which of the following conclusions is **best** supported by this evidence?
- A. Sea levels were much higher in the past.
 - B. The climate on Earth has changed over time.
 - C. Total numbers of organisms on Earth have changed over time.
 - D. The total amount of radiation from the Sun was much higher in the past.

- 8 The picture below shows a beaker containing a clear liquid with a temperature of 20°C .

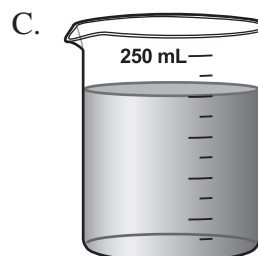


20°C , clear

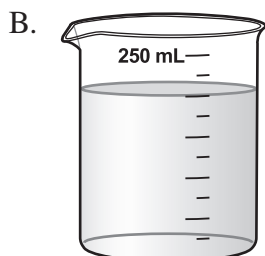
A blue powder is added to the liquid. Which of the following pictures provides the best evidence that the change to the liquid is physical, not chemical?



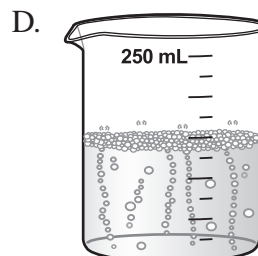
20°C , blue



5°C , blue



35°C , clear



20°C , clear

- 9 Ann makes hats for people. She has each person select the fabric and a hat style before she makes the hat to fit the person's head size.
- Which type of manufacturing system is Ann **most likely** using to make hats?
- A. mass production
 - B. custom production
 - C. automated production
 - D. assembly line production

- 10 Which of the following are formed when two crustal plates collide with one another?
- A. hot spots
 - B. rift valleys
 - C. mountain ranges
 - D. mid-ocean ridges

- 11 Leather basketballs are made for indoor use on smooth surfaces. Rubber basketballs are made for use on many different surfaces.
- Which of the following properties of rubber makes it better than leather for use on many different surfaces?
- A. Rubber is durable.
 - B. Rubber is lightweight.
 - C. Rubber is dark in color.
 - D. Rubber is quickly produced.

Question 12 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 12 in the space provided in your Student Answer Booklet.

- 12** A scientist has three unlabeled samples of pure metals. He wants to determine the identity of each metal.
- Identify which **one** of the following properties the scientist should use to determine the identity of the pure metal in each sample: color, melting point, mass, or volume.
 - Explain why the property you identified in part (a) can be used to determine the identity of the pure metal in each sample.

The scientist cuts each of the samples of pure metal into two smaller pieces.

- Is the property that is used to determine the identity of the metal affected when each sample is cut into two pieces? Explain your answer.

The scientist can also use density to determine the identity of the pure metal in each sample.

- Describe how the scientist can determine the density of the pure metal in each sample.

Science and Technology/Engineering

SESSION 2

DIRECTIONS

This session contains eight multiple-choice questions and one open-response question. Mark your answers to these questions in the spaces provided in your Student Answer Booklet.

13 Which of the following statements **best** describes how the four planets closest to the Sun are different from the next four planets in our solar system?

- A. The four closest planets are more dense.
- B. The four closest planets have more moons.
- C. The four closest planets have greater diameters.
- D. The four closest planets take longer to complete one orbit.

14 Which of the following parts of the human body is **most** complex?

- A. heart
- B. kidney
- C. white blood cell
- D. central nervous system

- 15 Some types of bacteria can only live where oxygen is **not** present. These bacteria were well adapted to life on Earth over 2 billion years ago.

Which of the following changes caused many of these bacteria to become extinct?

- A. the slow movement of tectonic plates
- B. the varying temperatures of each season
- C. an increase in volcanic activity under the oceans
- D. an increase in the number of photosynthetic organisms

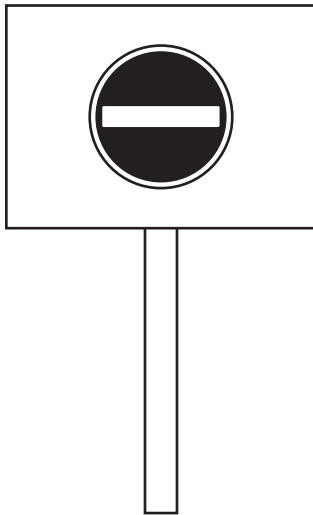
- 16 A ship has a satellite communication device to identify the ship's position at sea. For which of the following activities is this device **most likely** used?

- A. control
- B. guidance
- C. propulsion
- D. suspension

- 17 Which of the following could occur as a result of decreasing the heat energy of a gas?

- A. condensation
- B. evaporation
- C. radiation
- D. vaporization

- 18 The international highway symbol for “No Entry” is shown on the sign below.



Which of the following is the **most** important reason why this symbol is used on roads throughout Europe?

- A. Symbols take up less space on a sign than words.
- B. European countries have many different languages.
- C. Small children can understand symbols better than words.
- D. One factory can make signs used by many European countries.

- 19 Miriam notices when she goes to the beach that sometimes the water rises as high as the pier. At other times of the day, the water barely covers the pillars under the pier.

These differences in water level are **primarily** due to the gravitational influence of which of the following?

- A. the Sun
- B. the Moon
- C. asteroids
- D. comets

- 20 The winter solstice occurs on either December 21 or 22, depending on the year. Which of the following statements **best** explains why the time of the year the winter solstice occurs has the least amount of daylight in Massachusetts?

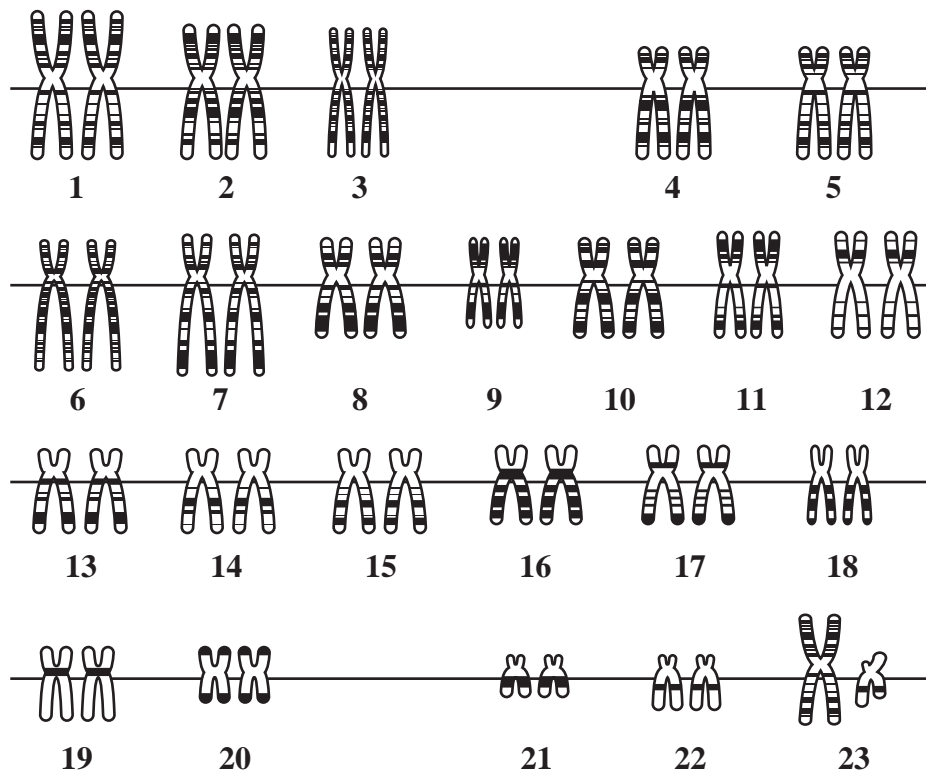
- A. Earth is farthest away from the Sun on the winter solstice.
- B. Earth's rotational speed on its axis is greatest on the winter solstice.
- C. Earth is traveling around the Sun with the greatest speed on the winter solstice.
- D. Earth's Northern Hemisphere is tilted away from the Sun on the winter solstice.

Question 21 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 21 in the space provided in your Student Answer Booklet.

- 21** The diagram below represents 23 pairs of structures taken from the nucleus of a human body cell.



- Identify the structures shown in the diagram.
- Identify the information that is contained within these structures.
- Describe how the structures from this cell would compare to the structures in the nucleus of another body cell from the same person.
- Explain why the structures are in pairs.

**Grade 8 Science and Technology/Engineering
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers***

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	286	<i>Technology/Engineering</i>	3.2	D
2	286	<i>Earth and Space Science</i>	5	D
3	287	<i>Life Science</i>	2	A
4	287	<i>Technology/Engineering</i>	5.2	C
5	288	<i>Physical Sciences</i>	5	B
6	288	<i>Earth and Space Science</i>	3	D
7	288	<i>Earth and Space Science</i>	7	B
8	289	<i>Physical Sciences</i>	10	A
9	290	<i>Technology/Engineering</i>	4.1	B
10	290	<i>Earth and Space Science</i>	6	C
11	290	<i>Technology/Engineering</i>	2.4	A
12	291	<i>Physical Sciences</i>	9	
13	292	<i>Earth and Space Science</i>	10	A
14	292	<i>Life Science</i>	5	D
15	293	<i>Life Science</i>	12	D
16	293	<i>Technology/Engineering</i>	6.3	B
17	293	<i>Physical Sciences</i>	15	A
18	294	<i>Technology/Engineering</i>	3.4	B
19	294	<i>Earth and Space Science</i>	9	B
20	294	<i>Earth and Space Science</i>	11	D
21	295	<i>Life Science</i>	8	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

**Grade 8 Science and Technology/Engineering
Spring 2012 Unreleased Common Items:
Reporting Categories and Standards**

Item No.	Reporting Category	Standard
22	<i>Physical Sciences</i>	3
23	<i>Life Science</i>	11
24	<i>Technology/Engineering</i>	2.3
25	<i>Life Science</i>	16
26	<i>Life Science</i>	13
27	<i>Physical Sciences</i>	8
28	<i>Earth and Space Science</i>	1
29	<i>Physical Sciences</i>	6
30	<i>Life Science</i>	1
31	<i>Physical Sciences</i>	13
32	<i>Technology/Engineering</i>	2.5
33	<i>Life Science</i>	15
34	<i>Technology/Engineering</i>	2.6
35	<i>Physical Sciences</i>	2
36	<i>Earth and Space Science</i>	4
37	<i>Technology/Engineering</i>	1.3
38	<i>Physical Sciences</i>	4
39	<i>Earth and Space Science</i>	2
40	<i>Life Science</i>	18
41	<i>Physical Sciences</i>	14
42	<i>Technology/Engineering</i>	6.4

XVIII. Biology, High School

High School Biology Test

The spring 2012 high school Biology test was based on learning standards in the Biology content strand of the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). These learning standards appear on pages 54–58 of the *Framework*.

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Biology test results are reported under the following five MCAS reporting categories:

- Biochemistry and Cell Biology
- Genetics
- Anatomy and Physiology
- Ecology
- Evolution and Biodiversity

Test Sessions

The high school Biology test included two separate test sessions, which were administered on consecutive days. Each session included multiple-choice and open-response questions.

Reference Materials and Tools

The high school Biology test was designed to be taken without the aid of a calculator. Students were allowed to have calculators with them during testing, but calculators were not needed to answer questions.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Biology test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The table at the conclusion of this chapter indicates each item's reporting category and the framework learning standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

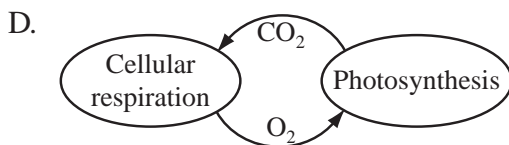
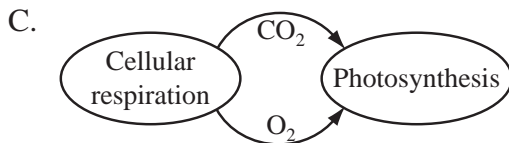
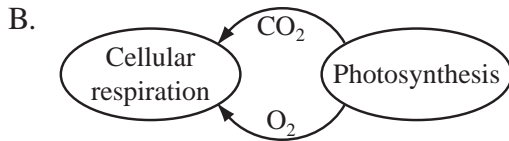
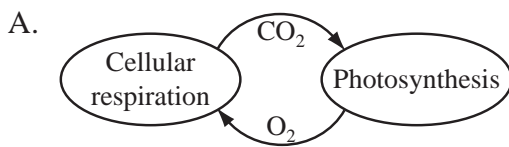
Biology

SESSION 1

DIRECTIONS

This session contains twenty-one multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 1 Which of the following diagrams accurately represents the use of gases in both cellular respiration and photosynthesis?



- 2 Hepatitis is a disease of the liver. Which of the following happens as a result of decreased liver function?

- A. Carbon dioxide builds up in the liver.
- B. Toxic compounds build up in the blood.
- C. The kidneys take over the functions of the liver.
- D. The stomach produces the enzymes needed for digestion.

- 3 A species of newt produces a toxin that can kill predators. Scientists have observed that some garter snakes can feed on the newts because they have a natural resistance to the toxin.

In areas where populations of newts and garter snakes interact, which of the following predictions is **best** supported by evolutionary theory?

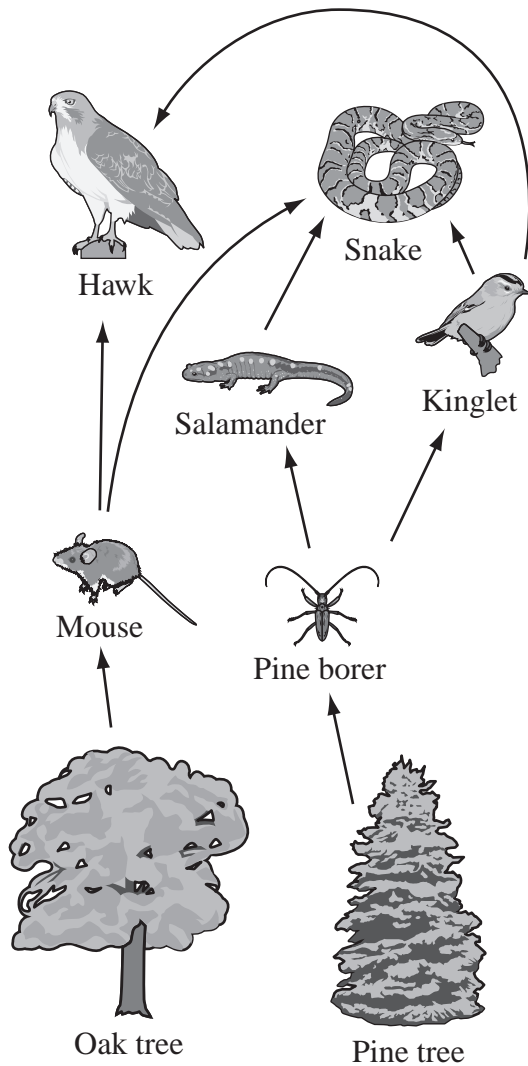
- A. The garter snakes with resistance to the toxin will successfully reproduce and pass the trait on to their offspring.
- B. The garter snakes without resistance to the toxin will acquire resistance by increasing the rate at which they feed on the newts.
- C. The newts that produce low levels of toxin will also develop camouflage adaptations that allow them to hide from the garter snakes.
- D. The newts will stop making the toxin rather than continue to use energy to make a toxin that is ineffective against the garter snakes.

- 4 At one time, all the continents on Earth were joined in a supercontinent called Pangaea. Over time Pangaea split into separate continents.

Which of the following statements describes a result of this split?

- A. All fossil evidence of species from Pangaea was lost.
- B. Organisms on the separated continents no longer migrated for breeding.
- C. Ancestral organisms evolved into different species on the separated continents.
- D. Evolution in species proceeded more slowly on the separate continents than it had on Pangaea.

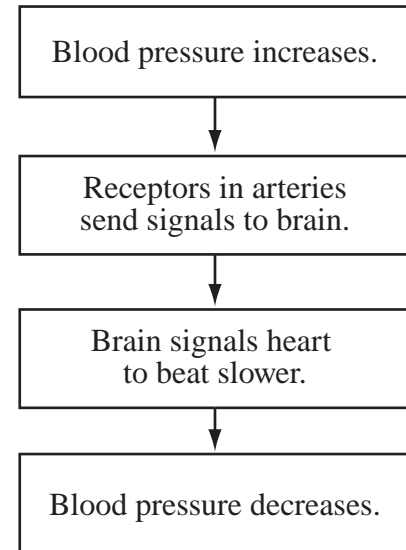
- 5 A food web is shown below.



Which of the following organisms compete for the mouse as a food source?

- A. hawk and snake
- B. snake and kinglet
- C. oak tree and pine tree
- D. pine borer and salamander

- 6 The diagram below shows one response pathway the human body uses to control blood pressure.



Which body systems work together in this response pathway to control blood pressure?

- A. digestive and nervous
- B. nervous and circulatory
- C. respiratory and digestive
- D. circulatory and excretory

- 7 The table below presents a variety of mRNA three-base sequences (codons) and the amino acids for which these sequences code.

First Base of mRNA	Second Base of mRNA	Third Base of mRNA	Amino Acid
G	A	A	glutamic acid
		C	aspartic acid
		G	glutamic acid
		U	aspartic acid
	G	A	glycine
		C	glycine
		G	glycine
		U	glycine
	U	A	valine
		C	valine
		G	valine
		U	valine

Based on the information in the table, which of the following changes is **least likely** to produce a phenotypic change in an organism?

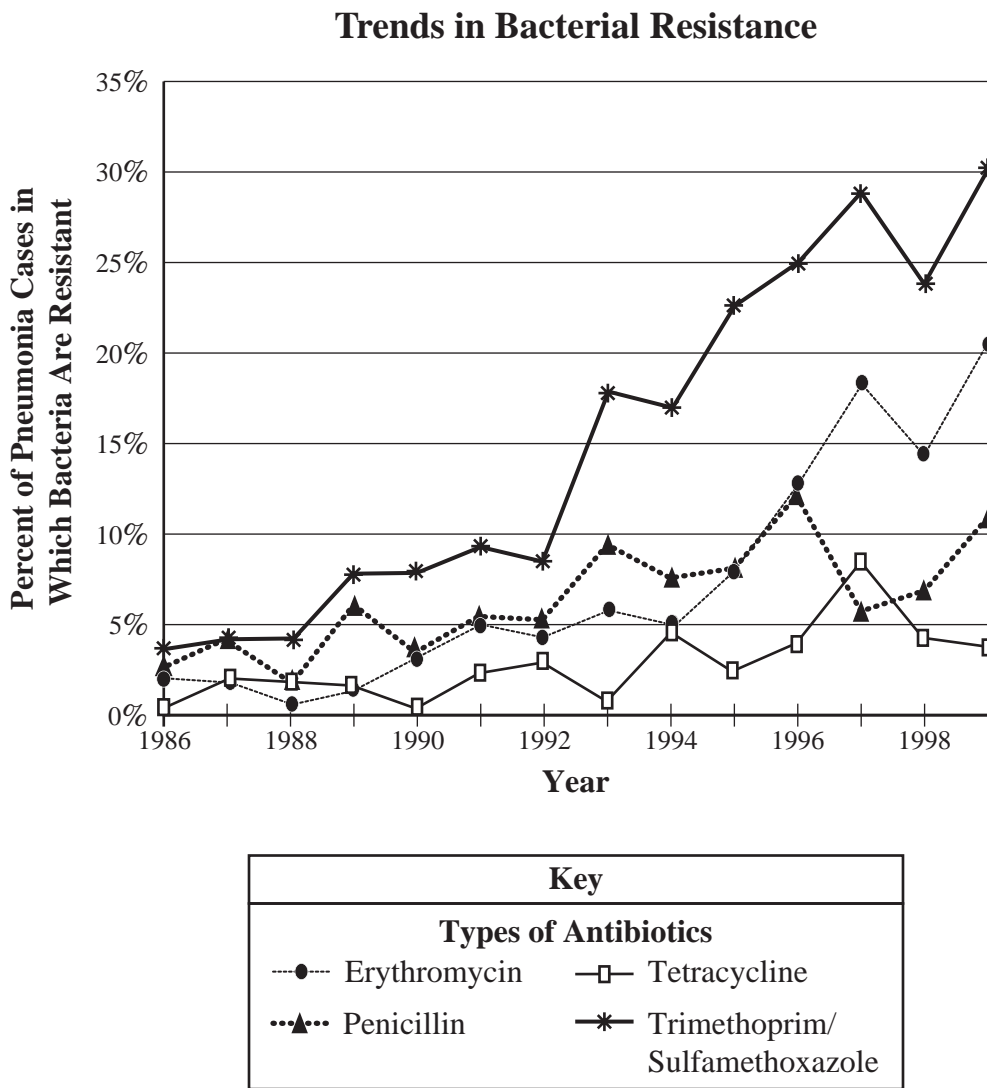
- A. GAU to GGU
- B. GAU to GUU
- C. GAU to GAA
- D. GAU to GAC

The following section focuses on bacterial resistance to several antibiotics.

Read the information below and use it to answer the four multiple-choice questions and one open-response question that follow.

One of the most important developments in modern medicine was the discovery of antibiotics. Antibiotics are used to treat infections caused by bacteria. However, strains of bacteria that are resistant to antibiotics are emerging. The rate of increase in infections caused by these antibiotic-resistant strains of bacteria is a concern for human health.

The bacterium *Streptococcus pneumoniae* is a major cause of the respiratory disease pneumonia. The graph below shows trends in bacterial resistance to different antibiotics in pneumonia cases from 1986 to 1999.



Mark your answers to multiple-choice questions 8 through 11 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 8 Antibiotics are helpful in treating an infection when the number of bacteria becomes too large for the body's immune system to fight on its own. What process enables the bacteria to multiply inside the body?
- A. binary fission
 - B. fertilization
 - C. meiosis
 - D. nitrogen fixation
- 9 Some antibiotics work by disrupting ATP production in bacteria. Which of the following will the bacteria lack when ATP production is disrupted?
- A. genetic material for reproduction
 - B. energy to perform life processes
 - C. nucleic acids to make proteins
 - D. cytoplasm to diffuse oxygen
- 10 When *Streptococcus pneumoniae* are exposed to an antibiotic, the bacteria try to pump the antibiotic out of their cells. Which of the following mechanisms is **most likely** used by the *Streptococcus pneumoniae* to pump the antibiotic out of their cells?
- A. active transport
 - B. diffusion
 - C. facilitated diffusion
 - D. osmosis
- 11 Resistance to antibiotics results from variations in the genetic code of *Streptococcus pneumoniae*. Which type of molecule encodes genetic information in *Streptococcus pneumoniae*?
- A. carbohydrate
 - B. fatty acid
 - C. nucleic acid
 - D. protein

Question 12 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 12 in the space provided in your Student Answer Booklet.

- 12** The graph shows the changes in antibiotic resistance of *Streptococcus pneumoniae* over time.
- a. Based on the graph, which antibiotic had *Streptococcus pneumoniae* become **most** resistant to by 1999?
 - b. Describe what usually happens to a population of *Streptococcus pneumoniae* immediately after it is exposed to a **new** antibiotic.
 - c. Explain, in detail, how antibiotic-resistant populations of *Streptococcus pneumoniae* develop over time as a result of the process of natural selection.

Mark your answers to multiple-choice questions 13 through 22 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

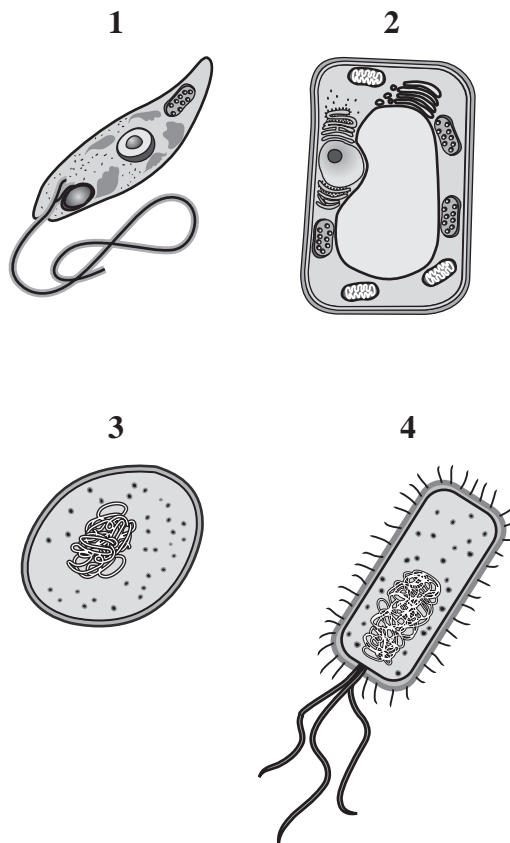
- 13 Long-tailed weasels and European otters are both classified into the family Mustelidae. Which of the following types of information was **most likely** used to classify these animals into the same family?

A. food source
B. skeletal structure
C. location of habitat
D. method of movement

- 14 Which of the following is currently a primary cause of species decline worldwide?

A. habitat destruction
B. intraspecific competition
C. random mating
D. viral outbreaks

- 15 Each of the illustrations below shows either a prokaryotic cell or a eukaryotic cell. Each cell is numbered.



(Not to scale)

Which two cells should be classified as prokaryotic cells?

A. 1 and 2
B. 1 and 3
C. 2 and 4
D. 3 and 4

- 16 Which of the following statements describes a DNA molecule?
- A. It contains the base uracil.
 - B. It has a double helix shape.
 - C. It contains five phosphate groups per nucleotide.
 - D. It has a backbone of twenty different nucleotides.

- 17 Height is a polygenic trait in humans. Which of the following statements **best** explains the genetics of this trait?
- A. Height is controlled by more than one gene.
 - B. Height is controlled by a single dominant gene.
 - C. The gene for height is located on the X chromosome.
 - D. The gene for height is located on the Y chromosome.

- 18 Spruce budworms are a type of moth. For every 100 budworm eggs, only about 1% reach adulthood. The table below shows the average number of budworms that survive and the main cause of death at each life cycle stage prior to the adult stage.

Stage in Life Cycle	Average Number Alive at Start of Stage	Main Cause of Death during Stage
egg	100	parasite
early larva	85	dispersal to unsuitable habitat
late larva	17	parasite, disease
pupa	2	parasite
adult	1	

Based on the data in the table, which of the following changes would **most** improve the percentage of budworms surviving to adulthood?

- A. a thinner cocoon wall in the pupal stage
- B. a slower rate of development in the late larval stage
- C. a decrease in exposure to disease in the pupal stage
- D. an increase in resistance to parasites during the egg stage

- 19 In mussels, the allele for brown coloring (**B**) is dominant, and the allele for blue coloring (**b**) is recessive. For which parental genotypes are 100% of the offspring expected to be blue?

A. **Bb** × **Bb**
B. **BB** × **bb**
C. **bb** × **bb**
D. **BB** × **BB**

- 20 Specific DNA sequences called “promoters” provide binding sites for the enzyme that synthesizes RNA. Promoters are directly involved in which cellular process?

A. active transport
B. crossing over
C. replication
D. transcription

- 21 Students digging near their school unearthed four objects. One of the objects was part of the exoskeleton of an insect. The table below shows the results of a chemical analysis of the objects.

Object	Chemical Composition
W	chlorine, sodium
X	oxygen, silicon
Y	carbon, hydrogen, nitrogen, oxygen
Z	aluminum, silicon, oxygen, hydrogen

Based on the chemical analysis, which object is most likely from the exoskeleton?

A. object W
B. object X
C. object Y
D. object Z

- 22 In the human respiratory system, the contraction and relaxation of a muscle called the diaphragm helps move air through which of the following structures?

A. artery, capillary, and vein
B. larynx, pharynx, and trachea
C. atrium, trachea, and ventricle
D. esophagus, kidney, and pharynx

Question 23 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 23 in the space provided in your Student Answer Booklet.

- 23** Various types of evidence can be used to distinguish organisms in different kingdoms.
- a. Describe **two** ways to distinguish bacteria from protists, using cell structures or means of obtaining nourishment.
 - b. Describe **two** ways to distinguish fungi from plants, using cell structures or means of obtaining nourishment.

Biology

SESSION 2

DIRECTIONS

This session contains nineteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 24 Scientific evidence shows that modern dogs, wolves, and foxes all have a common ancestor. Further evidence shows that dogs are more closely related to wolves than to foxes.

Which of the following observations provides the **best** evidence that dogs are more closely related to wolves than to foxes?

- A. The diets of dogs and wolves are more similar than the diets of dogs and foxes.
- B. The lifespans of dogs and wolves are more similar than the lifespans of dogs and foxes.
- C. The genetic sequences of dogs and wolves are more similar than the genetic sequences of dogs and foxes.
- D. The body sizes of dogs and wolves are more similar than the body sizes of dogs and foxes.

- 25 In which part of the human digestive system do both physical breakdown and chemical breakdown of food first begin?

- A. esophagus
- B. mouth
- C. large intestine
- D. small intestine

- 26 The human body regularly sheds and replaces its skin cells. Which of the following processes is directly responsible for replacing these cells?

- A. meiosis
- B. mitosis
- C. osmosis
- D. transcription

- 27 The diagram below shows a pair of DNA nucleotides. The nitrogenous base guanine (G) is labeled.

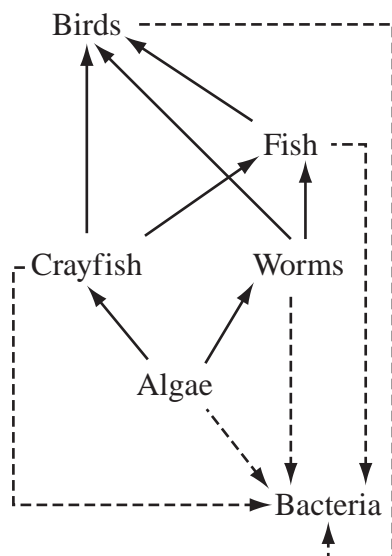


Which nitrogenous base pairs with guanine?

- A. adenine (A)
- B. cytosine (C)
- C. thymine (T)
- D. uracil (U)

- 28 An animal population decreases from 800 individuals to 600 individuals. Which of the following could explain this change in population size?
- A. The population size of the animal's predator increased.
 - B. The emigration rate of the animals from the population decreased.
 - C. The number of breeding pairs in the animal's population increased.
 - D. The number of species competing with the animal for food decreased.

- 29 Part of a marsh food web is shown below.



Which of the following statements correctly describes organisms in this food web?

- A. The birds are producers.
- B. The algae are consumers.
- C. The worms are carnivores.
- D. The bacteria are decomposers.

- 30 A student is preparing to run in a school track competition. For the quickest source of energy, the student should eat a food that contains a high percentage of

- A. carbohydrates.
- B. fat.
- C. proteins.
- D. sodium.

- 31 Which of the following is the **best** example of natural selection?

- A. The lifespan of a chimpanzee is extended to 60 years in captivity.
- B. The population size of giraffes changes over time as a result of immigration.
- C. The bone density of a human increases significantly as a result of participation in sports.
- D. The average toxin level in a poisonous frog population increases over time in response to high predation.

Question 32 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 32 in the space provided in your Student Answer Booklet.

- 32** The illustrations below show a smooth muscle cell and a skeletal muscle cell.



Smooth muscle cell



Skeletal muscle cell

- Identify one location where smooth muscle is found in the human body **and** whether smooth muscle is under voluntary or involuntary control.
- Identify one location where skeletal muscle is found in the human body **and** whether skeletal muscle is under voluntary or involuntary control.

The third type of muscle in the human body is cardiac muscle.

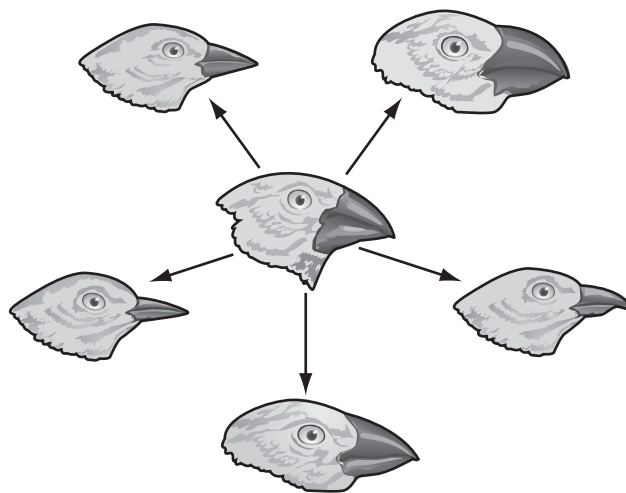
- Identify whether cardiac muscle is more similar to smooth muscle or skeletal muscle. Provide **two** reasons to support your answer.

Mark your answers to multiple-choice questions 33 through 43 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 33 The number of monarch butterflies counted in one location in the western United States dropped from 354,300 to 50,853 over a 10-year period. Which of the following statements **best** explains the drop in the number of monarch butterflies counted?

A. The death rate was greater than the birth rate.
B. The emigration rate was greater than the death rate.
C. The birth rate was greater than the immigration rate.
D. The immigration rate was greater than the emigration rate.

- 34 The diagram below shows many finch species that originated from a single ancestral finch species in the Galápagos Islands.



Which of the following statements best explains why many different finch species originated from the single ancestral species?

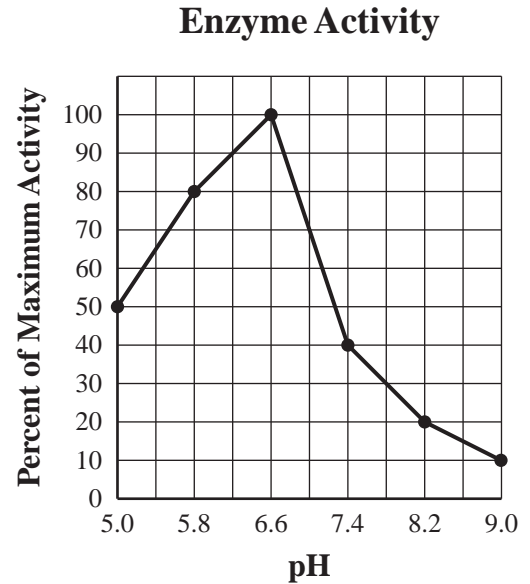
A. Populations adapted to environmental pressures.
B. Recessive traits in populations were eliminated over time.
C. Individuals acquired unique characteristics during their lifetimes.
D. Random mutation caused some individuals to have harmful traits.

- 35 Many lichens are composed of fungi and algae. The fungi get sugars from the algae, and the algae get water, minerals, and proteins from the fungi.

Which of the following terms **best** describes the relationship between the organisms in the lichens?

- A. commensalism
- B. competition
- C. mutualism
- D. parasitism

- 36 The graph below shows how the activity of an enzyme changes over a range of pH values.



Which of the following conclusions is supported by the data?

- A. The optimum pH of the enzyme is 6.6.
- B. The optimum pH of the enzyme is 5.8.
- C. The enzyme's activity is greater around pH 8.0 than around pH 5.0.
- D. The enzyme's activity continually increases as pH increases from 5.0 to 9.0.

- 37 In guinea pigs, the allele for black hair (**B**) is dominant to the allele for brown hair (**b**). Two black-haired guinea pigs are crossed. One of the guinea pigs is homozygous for black hair and one is heterozygous.

What percentage of the offspring are expected to have black hair?

- A. 25%
- B. 50%
- C. 75%
- D. 100%

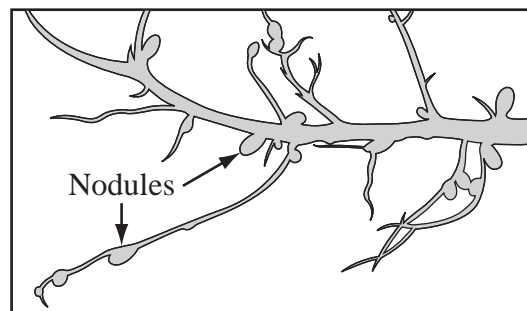
- 38 Acetylcholine is a neurotransmitter in the human body. As a neurotransmitter, acetylcholine is directly responsible for which of the following?

- A. speeding up the rate of biochemical reactions in cells
- B. assisting in the transport of nutrients in the bloodstream
- C. carrying the signal for a nerve impulse from one neuron to the next
- D. facilitating diffusion of amino acids across the plasma membrane of cells

- 39 Which of the following statements is correct about the hierarchy of the taxonomic system currently used to classify organisms?

- A. All organisms of a given order belong to the same species.
- B. Many different classes of organisms belong to the same order.
- C. All organisms of a given phylum belong to the same kingdom.
- D. Many different families of organisms belong to the same genus.

- 40 The illustration below shows part of a clover root system. Two root nodules are labeled.



The nodules contain which of the following to fix nitrogen for the plant?

- A. bacteria
- B. gases
- C. hormones
- D. worms

- 41 The table below shows the genotypes that result in four different blood types in humans.

Genotype	Blood Type
$I^A I^A$, $I^A i$	A
$I^B I^B$, $I^B i$	B
$I^A I^B$	AB
ii	O

Based on the information in the table, which of the following describes alleles I^A and I^B ?

- A. The I^A and I^B alleles show sex linkage.
- B. The I^A allele is recessive to the I^B allele.
- C. The I^A allele is dominant to the I^B allele.
- D. The I^A and I^B alleles show codominance.
- 42 Whale fins and bat wings are anatomically similar. Which of the following does this suggest about the animals?
- A. Whales and bats move in the same way.
- B. Whales and bats have a common ancestry.
- C. Whales and bats have existed for the same amount of time.
- D. Whales and bats were once adapted to the same environment.
- 43 An amoeba in a pond engulfs and consumes a paramecium. The amoeba uses which of the following to quickly break down the organic molecules in the paramecium?
- A. enzymes
- B. glucose
- C. polysaccharides
- D. water

Questions 44 and 45 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 44 in the space provided in your Student Answer Booklet.

- 44** In tomato plants, the allele for red fruit color (**R**) is dominant to the allele for yellow fruit color (**r**). The allele for round-shaped fruit (**F**) is dominant to the allele for pear-shaped fruit (**f**).

Two tomato plants, heterozygous for fruit color and fruit shape, are crossed. The Punnett square for this dihybrid cross is shown below.

	RF	Rf	rF	rf
RF	RRFF	RRFf	RrFF	RrFf
Rf	RRFf	RRff	RrFf	Rrff
rF	RrFF	RrFf	rrFF	rrFf
rf	RrFf	Rrff	rrFf	rrff

- For this cross, identify all the possible phenotypes of the offspring.
- Considering only fruit color, determine the ratio of offspring with red fruit to offspring with yellow fruit predicted by the Punnett square.
- Considering only fruit shape, determine the ratio of offspring with round-shaped fruit to offspring with pear-shaped fruit predicted by the Punnett square.
- Explain what is meant by independent assortment **and** describe one way in which your answers to parts (a), (b), and (c) support the conclusion that the genes for fruit color and fruit shape sort independently.

Write your answer to question 45 in the space provided in your Student Answer Booklet.

45 The trees in tropical rain forests are important to nutrient cycling in the biosphere.

- a. Describe one role of the trees in the carbon cycle.
- b. Describe one role of the trees in the oxygen cycle.
- c. Describe one role of the trees in the water cycle.

Some rain forest trees are destroyed by burning, while some others are cut down and left on the forest floor.

- d. Describe one way that burning rain forest trees affects nutrient cycling differently than cutting them down and leaving them on the forest floor.

High School Biology
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	306	<i>Biochemistry and Cell Biology</i>	2.4	A
2	306	<i>Anatomy and Physiology</i>	4.2	B
3	307	<i>Evolution and Biodiversity</i>	5.3	A
4	307	<i>Evolution and Biodiversity</i>	5.2	C
5	308	<i>Ecology</i>	6.3	A
6	308	<i>Anatomy and Physiology</i>	4.8	B
7	309	<i>Genetics</i>	3.3	D
8	311	<i>Biochemistry and Cell Biology</i>	2.3	A
9	311	<i>Biochemistry and Cell Biology</i>	2.5	B
10	311	<i>Biochemistry and Cell Biology</i>	2.1	A
11	311	<i>Biochemistry and Cell Biology</i>	1.2	C
12	312	<i>Evolution and Biodiversity</i>	5.3	
13	313	<i>Evolution and Biodiversity</i>	5.2	B
14	313	<i>Ecology</i>	6.2	A
15	313	<i>Biochemistry and Cell Biology</i>	2.2	D
16	314	<i>Genetics</i>	3.1	B
17	314	<i>Genetics</i>	3.4	A
18	315	<i>Ecology</i>	6.1	D
19	316	<i>Genetics</i>	3.6	C
20	316	<i>Genetics</i>	3.2	D
21	316	<i>Biochemistry and Cell Biology</i>	1.1	C
22	316	<i>Anatomy and Physiology</i>	4.3	B
23	317	<i>Biochemistry and Cell Biology</i>	2.3	
24	318	<i>Evolution and Biodiversity</i>	5.1	C
25	318	<i>Anatomy and Physiology</i>	4.1	B
26	318	<i>Biochemistry and Cell Biology</i>	2.6	B
27	318	<i>Genetics</i>	3.1	B
28	319	<i>Ecology</i>	6.2	A
29	319	<i>Ecology</i>	6.3	D
30	319	<i>Biochemistry and Cell Biology</i>	1.2	A
31	319	<i>Evolution and Biodiversity</i>	5.3	D
32	320	<i>Anatomy and Physiology</i>	4.5	
33	321	<i>Ecology</i>	6.1	A
34	321	<i>Evolution and Biodiversity</i>	5.1	A
35	322	<i>Ecology</i>	6.3	C
36	322	<i>Biochemistry and Cell Biology</i>	1.3	A
37	323	<i>Genetics</i>	3.6	D
38	323	<i>Anatomy and Physiology</i>	4.7	C
39	323	<i>Evolution and Biodiversity</i>	5.2	C

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
40	323	<i>Ecology</i>	6.4	A
41	324	<i>Genetics</i>	3.4	D
42	324	<i>Evolution and Biodiversity</i>	5.1	B
43	324	<i>Biochemistry and Cell Biology</i>	1.3	A
44	325	<i>Genetics</i>	3.5	
45	326	<i>Ecology</i>	6.4	

* Answers are provided here for multiple-choice items and short-answer items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

XIX. Chemistry, High School

High School Chemistry Test

The spring 2012 high school Chemistry test was based on learning standards in the Chemistry content strand of the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). These learning standards appear on pages 69–73 of the *Framework*.

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Chemistry test results are reported under the following four MCAS reporting categories:

- Atomic Structure and Periodicity
- Bonding and Reactions
- Properties of Matter and Thermochemistry
- Solutions, Equilibrium, and Acid-Base Theory

Test Sessions

The high school Chemistry test included two separate test sessions, which were administered on consecutive days. Each session included multiple-choice and open-response questions.

Reference Materials and Tools

Each student taking the high school Chemistry test was provided with a Chemistry Formula and Constants Sheet/Periodic Table of the Elements. Copies of both sides of this formula sheet follow the final question in this chapter.

Each student also had sole access to a calculator with at least four functions and a square-root key.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Chemistry test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The table at the conclusion of this chapter indicates each item's reporting category and the framework learning standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

Chemistry

SESSION 1

DIRECTIONS

This session contains twenty-one multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

1

Which of the following statements describes the difference between endothermic and exothermic chemical reactions?

- A. Energy is absorbed in endothermic reactions but is released in exothermic reactions.
- B. Energy is conserved in endothermic reactions but is not conserved in exothermic reactions.
- C. Endothermic reactions involve changes in the nucleus of an atom, but exothermic reactions do not involve changes in the nucleus.
- D. Endothermic reactions occur when electrons are shared between atoms, but exothermic reactions occur when electrons are transferred between atoms.

2

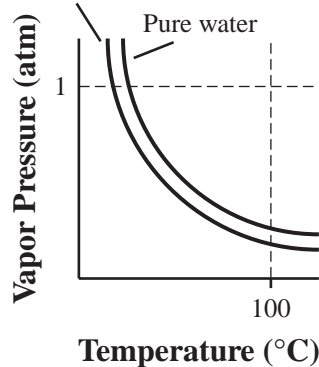
Cobalt has an atomic mass of 59 and an atomic number of 27. What does this information reveal about **most** cobalt atoms?

- A. They contain more neutrons than protons.
- B. They naturally have a net negative charge.
- C. They attract protons more strongly than electrons.
- D. They form ions with a charge of +27 in compounds.

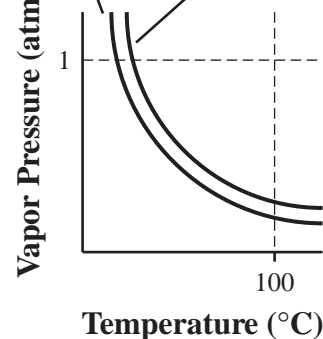
- 3 A liquid boils when its vapor pressure equals the pressure of the atmosphere. A student creates a graph of vapor pressure as a function of temperature for pure water and for a solution of water and sucrose.

Which of the following graphs **best** represents vapor pressure as a function of temperature for the two liquids?

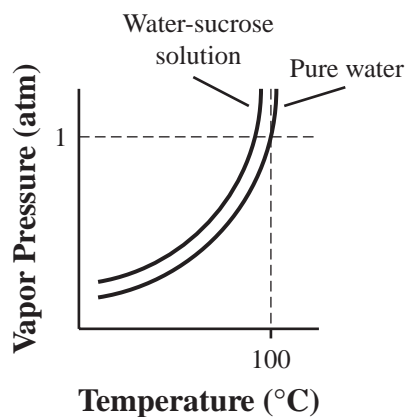
A. Water-sucrose solution



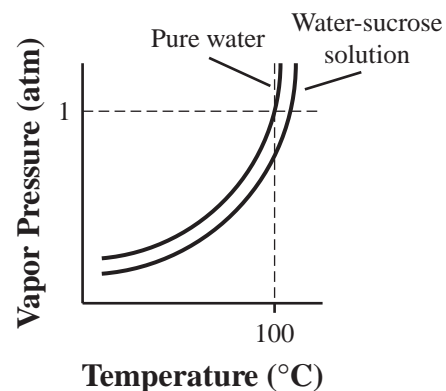
C. Pure water Water-sucrose solution



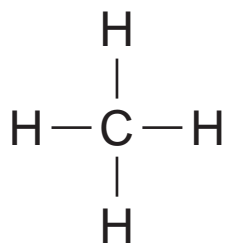
B.



D.



- 4 The diagram below represents one molecule of methane (CH_4).



Which of the following is a balanced equation for the synthesis of methane from carbon and hydrogen?

- A. $\text{C} + \text{H} \rightarrow \text{CH}_4$
- B. $\text{C}_4 + \text{H} \rightarrow \text{CH}_4$
- C. $\text{C} + 2\text{H}_2 \rightarrow \text{CH}_4$
- D. $\text{C}_2 + 4\text{H} \rightarrow \text{CH}_4$

- 5 Which of the following subatomic particles can be found inside the nucleus of an atom?

- A. electrons only
- B. neutrons only
- C. protons and neutrons
- D. protons, neutrons, and electrons

- 6 The table below contains data for mercury and water at standard pressure.

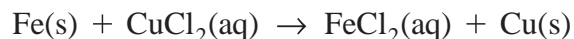
Substance	Melting Point (°C)	Boiling Point (°C)
mercury	−39	357
water	0.0	100

Based on the data in the table, which of the following pairs of substances could exist at the same temperature?

- A. ice and liquid mercury
- B. liquid water and solid mercury
- C. water vapor and solid mercury
- D. liquid water and mercury vapor

- 7 Three identical balloons each contain one mole of gas. One balloon contains oxygen, one contains nitrogen, and one contains argon.
- Which of the following changes in volume will happen if the balloons are placed in a warmer room?
- A. The balloon with argon will decrease most in volume because argon is a noble gas.
 - B. All of the balloons will decrease in volume equally because the temperature increased.
 - C. The balloon with oxygen will increase most in volume because oxygen has the largest molecules.
 - D. All of the balloons will increase in volume equally because they have equal numbers of molecules.
- 8 How many electrons are in the outermost energy shell of a calcium atom?
- A. 1
 - B. 2
 - C. 6
 - D. 8

- 9 A student adds iron filings to a copper(II) chloride solution at room temperature. A balanced equation for the reaction that occurs is shown below.



Which of the following changes would **most likely** increase the reaction rate?

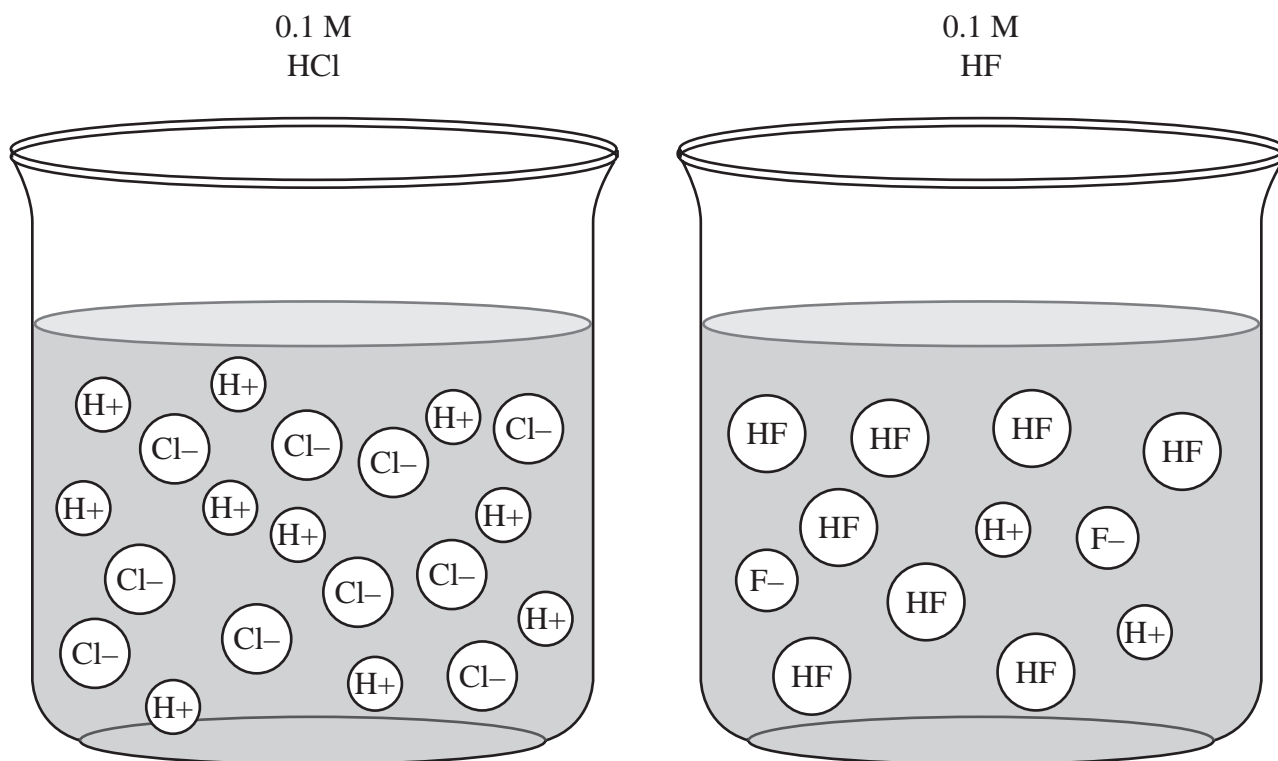
- A. using larger pieces of iron
 - B. performing the reaction in an ice bath
 - C. decreasing the volume of the CuCl_2 solution
 - D. increasing the concentration of the CuCl_2 solution
- 10 The equation below shows the reaction of ammonia with water.
- $$\text{NH}_3(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$$
- According to the Brønsted-Lowry theory of acids and bases, which of the following is acting as the acid for the forward reaction?
- A. NH_3
 - B. H_2O
 - C. NH_4^+
 - D. OH^-

Question 11 is an open-response question.

- BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.
- Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.
- If you do the work in your head, explain in writing how you did the work.

Write your answer to question 11 in the space provided in your Student Answer Booklet.

- 11 The diagrams below show a 0.1 M aqueous solution of HCl and a 0.1 M aqueous solution of HF.



- Identify HCl and HF as acids or bases. Explain your answer.
- The pH of the 0.1 M HCl solution is expected to be lower than the pH of the 0.1 M HF solution. Explain why, based on the diagrams of the solutions and the definition of pH.

Mark your answers to multiple-choice questions 12 through 22 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 12 Which of the following statements **best** describes what happens to water during evaporation?
- A. The temperature of the water increases until the water molecules react with nitrogen in the air.
 - B. Water molecules on the surface overcome intermolecular forces and change into the gas phase.
 - C. Water molecules on the surface come in contact with air molecules and are pulled into the gas phase.
 - D. The temperature of the water increases until the water molecules separate and form oxygen and hydrogen gas.

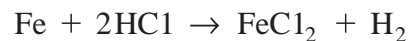
- 13 Which of the following is a correct Lewis dot structure for potassium chloride?

- A. $\text{K}^+[:\ddot{\text{Cl}}:]^-$
- B. $\text{K}^-[:\ddot{\text{Cl}}:]^+$
- C. $\text{K}^{2+}[:\ddot{\text{Cl}}:]^{2-}$
- D. $\text{K}^{2-}[:\ddot{\text{Cl}}:]^{2+}$

14 Which of the following statements best describes a difference between nuclear fission and nuclear fusion reactions?

- A. Nuclei split during fission and combine during fusion.
- B. Fission forms heavier elements, and fusion forms lighter elements.
- C. Fission generates potential energy, and fusion generates kinetic energy.
- D. Nuclei gain electrons during fission and release electrons during fusion.

15 Iron(II) chloride (FeCl_2) is a product of the reaction between iron metal (Fe) and hydrochloric acid (HCl), as shown in the equation below.



What is the change in oxidation number of iron in this reaction?

- A. from 0 to +2
- B. from +1 to +2
- C. from 0 to -2
- D. from -1 to -2

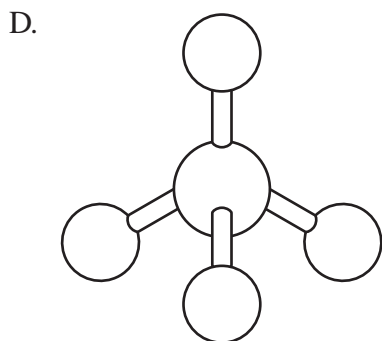
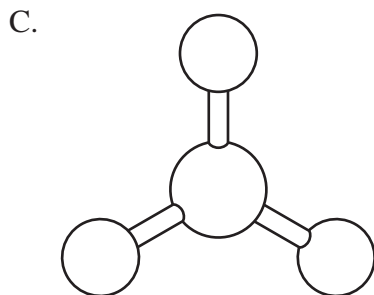
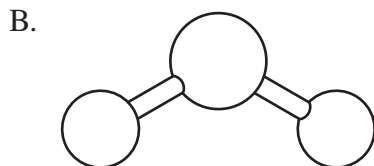
- 16 The reduction of carbon dioxide by hydrogen gas takes place at 420°C to produce water vapor and carbon monoxide. The equation for this reaction at equilibrium is shown below.



Which of the following changes in concentration occur when more water vapor is added to the system under equilibrium conditions?

- A. $[\text{H}_2]$ decreases, $[\text{CO}_2]$ decreases, $[\text{CO}]$ increases
- B. $[\text{H}_2]$ decreases, $[\text{CO}_2]$ decreases, $[\text{CO}]$ decreases
- C. $[\text{H}_2]$ increases, $[\text{CO}_2]$ increases, $[\text{CO}]$ increases
- D. $[\text{H}_2]$ increases, $[\text{CO}_2]$ increases, $[\text{CO}]$ decreases

- 17 Which of the following models **best** represents the shape of a compound with trigonal planar geometry?



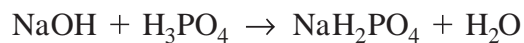
- 18 A neutral atom has an outer shell electron configuration of $2s^22p^6$. To which of the following groups of elements does it belong?

- A. alkali metals
- B. alkaline-earth metals
- C. halogens
- D. noble gases

- 19 Which of the following statements **best** explains why water has a high surface tension?
- A. The force of attraction between neighboring polar water molecules is weak.
 - B. The force of attraction between neighboring polar water molecules is strong.
 - C. The force of attraction between neighboring nonpolar water molecules is weak.
 - D. The force of attraction between neighboring nonpolar water molecules is strong.

- 20 In which of the following lists are the elements shown in order of increasing electronegativity?
- A. Li, Be, O, F
 - B. O, F, Be, Li
 - C. F, Li, O, Be
 - D. Li, F, Be, O

- 21 The balanced equation below represents the reaction of NaOH with H_3PO_4 .



When 20 g of NaOH reacts with 49 g of H_3PO_4 , 9 g of water is produced. How many grams of NaH_2PO_4 are produced?

- A. 11 g
- B. 60 g
- C. 69 g
- D. 78 g

- 22 The average distance between molecules always increases during which of the following phase changes?

- A. gas to solid
- B. liquid to gas
- C. gas to liquid
- D. liquid to solid

Question 23 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 23 in the space provided in your Student Answer Booklet.

23 Several properties for zinc (Zn) are listed below:

- brittle at room temperature, but malleable between 100°C and 150°C
 - bluish-white in color
 - burns in air at high temperatures, giving off zinc oxide (ZnO) gas
 - conducts heat and electricity
 - sinks in water
 - reacts with acids and bases
 - exposed surfaces tarnish in moist air
- a. Identify **two** physical properties of zinc from the list. Explain why the properties you identified are physical properties and not chemical properties.
- b. Identify **two** chemical properties of zinc from the list. Explain why the properties you identified are chemical properties and not physical properties.

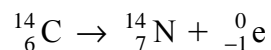
Chemistry

SESSION 2

DIRECTIONS

This session contains nineteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 24 In radiocarbon dating, carbon-14 undergoes decay to become nitrogen-14.



What type of reaction is this?

- A. fusion
- B. neutralization
- C. nuclear
- D. oxidation

- 25 Which of the following ideas was proposed by Niels Bohr?

- A. Electrons occupy specific energy levels within an atom.
- B. The nucleus of an atom contains neutrons as well as protons.
- C. An atom is a solid sphere that cannot be separated into smaller parts.
- D. An atom consists of negative charges embedded in a positively charged sphere.

- 26 Carbon reacts with chlorine to form CCl_4 . What is the name of this compound?

- A. carbon 4-chloride
- B. 1-carbon 4-chloride
- C. tetracarbon chloride
- D. carbon tetrachloride

- 27 A student has 84.0 g of N_2 gas in a sealed 500 L container at 20°C . Which of the following equations should the student use to calculate the gas pressure?

A. $P = 84.0 \text{ g} \times \frac{1 \text{ mol}}{28 \text{ g}} \times R \times 500 \text{ L}$

B. $P = 84.0 \text{ g} \times \frac{28 \text{ g}}{1 \text{ mol}} \times R \times 293 \text{ K} \times 500 \text{ L}$

C. $P = \frac{84.0 \text{ g} \times \frac{1 \text{ mol}}{28 \text{ g}} \times R \times 293 \text{ K}}{500 \text{ L}}$

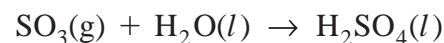
D. $P = \frac{84.0 \text{ g} \times \frac{28 \text{ g}}{1 \text{ mol}} \times R}{500 \text{ L}}$

28 A walk-in cooler has a volume of 1.1×10^4 L. If the temperature inside the cooler is 3°C and the gas pressure is 1.0 atm, how many moles of gas are inside the cooler?

- A. 4.9×10^2 mol
- B. 4.5×10^4 mol
- C. 2.5×10^5 mol
- D. 6.0×10^{23} mol

- 29 Aluminum (Al) has three electrons in its outer shell. Oxygen (O) needs two electrons to complete its outer shell. What is the chemical formula for aluminum oxide?
- A. AlO
 - B. AlO₂
 - C. Al₂O
 - D. Al₂O₃
- 30 Which of the following statements **best** explains why ionic solids dissolve in water?
- A. Water has high surface tension.
 - B. Water is a highly polar molecule.
 - C. Water is more dense as a liquid than as a solid.
 - D. Water has a higher boiling point than predicted by its molar mass.

- 31 The chemical equation below represents sulfur trioxide (SO₃) in the atmosphere mixing with rainwater to form sulfuric acid (H₂SO₄), which is a major component of acid rain.



The molar mass of SO₃ is 80.1 g/mol and the molar mass of H₂SO₄ is 98.1 g/mol. How much H₂SO₄ is produced when 128.0 g of SO₃ mixes with rainwater?

- A. 98.1 g
 - B. 105 g
 - C. 128 g
 - D. 157 g
- 32 Which of the following actions decreases the entropy of a system?
- A. boiling water
 - B. freezing water
 - C. dissolving salt in water
 - D. mixing baking soda and salt

Question 33 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 33 in the space provided in your Student Answer Booklet.

33 Five chemical reactions are listed in the table below.

Reaction 1	$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
Reaction 2	$\text{Ca(OH)}_2 + 2\text{HCl} \rightarrow \text{CaCl}_2 + 2\text{H}_2\text{O}$
Reaction 3	$\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$
Reaction 4	$\text{PbO}_2 \rightarrow \text{Pb} + \text{O}_2$
Reaction 5	$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

- Identify **one** chemical reaction from the list that is a synthesis (combination) reaction. Explain why you identified this reaction as synthesis.
- Identify **one** chemical reaction from the list that is a decomposition reaction. Explain why you identified this reaction as decomposition.
- Describe a combustion reaction.
- Write a balanced chemical equation for a combustion reaction using some or all of the substances from the table below.

C_3H_8	CO_2
O_2	H_2
C	H_2O

Mark your answers to multiple-choice questions 34 through 43 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

34 Which of the following statements explains why the human body produces chemical buffers?

- A. Buffers maintain a constant pH in the blood.
- B. Buffers dissolve salts and minerals in the blood.
- C. Buffers decompose food molecules during digestion.
- D. Buffers catalyze chemical reactions in the body cells.

35 A 6.0 M solution of HCl is diluted to 1.0 M. How many milliliters of the 6.0 M solution would be used to prepare 100.0 mL of the diluted 1.0 M solution?

- A. 6 mL
- B. 17 mL
- C. 33 mL
- D. 100 mL

36 After crude oil is pumped out of the ground, it must be processed in a “cracking tower.” The tower separates it into less dense chemicals like butane and gasoline, and more dense chemicals like diesel fuel and tar.

Based on this information, crude oil can best be classified as a

- A. pure compound.
- B. mixture of compounds.
- C. mixture of pure elements.
- D. solution of plasma and liquid.

- 37 When a cup of hot chocolate cools from 90°C to 80°C , which of the following is happening to the molecules of the liquid?

A. Their rate of motion is decreasing.

B. Their valence electrons are being lost.

C. Their positions are becoming fixed in crystals.

D. Their average distance from adjacent molecules is increasing.

- 38 A reaction yields 6.26 g of a product. What is the percent yield if the theoretical yield is 18.81 g?

A. 3.00%

B. 10.6%

C. 33.3%

D. 56.1%

- 39 The table below provides some information about an unidentified element.

Physical Properties: <ul style="list-style-type: none">• shiny silver-colored solid• easily flattened with small hammer• denser than water• has 4 valence electrons
Chemical Properties: <ul style="list-style-type: none">• does not react with sodium• reacts slowly with oxygen

Based on this information, the unidentified element is **best** classified as which of the following?

A. a metal in group 1 (1A)

B. a metal in group 14 (4A)

C. a nonmetal in period 4

D. a metalloid in period 5

- 40 Which of the following statements describes a gamma ray?
- A. A gamma ray has no mass.
 - B. A gamma ray has a positive charge.
 - C. A gamma ray can be stopped by a sheet of paper.
 - D. A gamma ray can be converted into a beta particle.

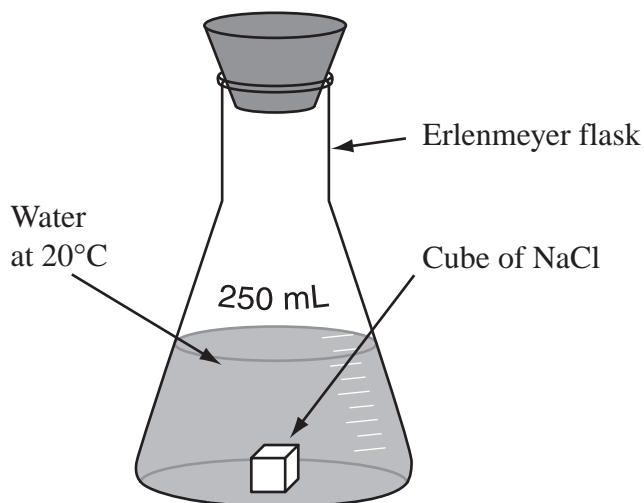
- 41 The table below shows the electronegativities of four elements.

Element	Electronegativity
carbon	2.6
fluorine	4.0
hydrogen	2.2
oxygen	3.4

Which of the following bonds is the **most** polar?

- A. carbon–hydrogen
- B. carbon–fluorine
- C. fluorine–fluorine
- D. hydrogen–oxygen

- 42 The diagram below shows a cube of sodium chloride beginning to dissolve in water.



Which of the following changes will cause the cube to dissolve more quickly?

- A. swirling the flask
- B. removing the stopper
- C. pouring off half the water
- D. decreasing the water temperature

- 43 When a scuba diver is deep underwater and exhales, air bubbles form and rise to the surface of the water. Which of the following statements **best** describes what happens to the air bubbles as they rise to the surface?

- A. The number of molecules in the bubbles increases, and the diameter of the bubbles increases.
- B. The number of molecules in the bubbles decreases, and the diameter of the bubbles decreases.
- C. The number of molecules in the bubbles remains the same, and the diameter of the bubbles increases.
- D. The number of molecules in the bubbles remains the same, and the diameter of the bubbles decreases.

Questions 44 and 45 are open-response questions.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 44 in the space provided in your Student Answer Booklet.

- 44** The elements helium, neon, and xenon are located in group 18 (8A) in the periodic table.
- Explain why the atomic number increases from helium to neon to xenon.
 - Explain why helium, neon, and xenon are located in different periods in the periodic table.
 - Describe the chemical reactivity of helium, neon, and xenon **and** explain how the location of these elements in the periodic table relates to their chemical reactivity.

Write your answer to question 45 in the space provided in your Student Answer Booklet.

- 45 Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) is formed in plants by the process of photosynthesis. The net equation for photosynthesis is shown below.



- Calculate the molar mass of glucose. Show your calculations and include units in your answer.
- Explain how the amount of carbon dioxide consumed by a plant can be determined from measuring the amount of oxygen released by the plant. Assume excess water is available.
- Calculate the amount of glucose, in grams, formed when 100 mol of O_2 is released. Show your calculations and include units in your answer.

Massachusetts Comprehensive Assessment System Chemistry Formula and Constants Sheet

Common Polyatomic Ions

Ion	Ionic Formula
Ammonium	NH_4^+
Carbonate	CO_3^{2-}
Hydroxide	OH^-
Nitrate	NO_3^-
Phosphate	PO_4^{3-}
Sulfate	SO_4^{2-}

Combined Gas Law: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

Ideal Gas Law: $PV = nRT$

Dilution Formula: $M_1 V_1 = M_2 V_2$

Molar Volume of Ideal Gas at STP: 22.4 L/mol

Ideal Gas Constant: $R = 0.0821 \text{ L} \cdot \text{atm/mol} \cdot \text{K} = 8.31 \text{ L} \cdot \text{kPa/mol} \cdot \text{K}$

STP: 1 atm (101.3 kPa), 273 K (0°C)

Absolute Temperature Conversion: $K = ^\circ\text{C} + 273$

Definition of pH: $\text{pH} = -\log [\text{H}_3\text{O}^+] = -\log [\text{H}^+]$

Avogadro's Number: 6.02×10^{23} particles/mol

Nuclear Symbols

Name	Symbol
Alpha particle	α or ${}^4_2\text{He}$
Beta particle	β or ${}^0_{-1}e$
Gamma ray	γ
Neutron	1_0n



Massachusetts Comprehensive Assessment System

Periodic Table of the Elements

Period

Group (Family)

1A

1

1.01

H

1

Hydrogen

2A

2

6.94

Li

3

Beryllium

24.31

3

Na

11

Mg

12

39.10

40.08

4

K

19

Ca

20

85.47

87.62

5

Rb

37

Sr

38

132.91

137.33

6

Cs

55

Ba

56

7

Fr

87

Ra

88

1A

1

4.00

He

2

Helium

20.18

2

Ne

10

3

Ar

18

39.95

4

Kr

36

83.80

5

Xe

54

131.29

6

Xenon

(222)

7

Rn

86

222

8A

18

17

16

15

14

13

12

11

10

9

8

7

6

5

4

3

2

1

10.81

12.01

14.01

16.00

19.00

20.18

26.98

28.09

30.97

32.06

35.45

39.95

44.96

47.88

50.94

52.00

54.94

55.85

58.93

58.69

63.55

65.39

69.72

72.59

74.92

78.96

79.90

83.80

85.47

87.62

88.91

91.22

92.91

95.94

98.91

101.07

102.91

106.42

107.87

112.41

114.82

118.71

121.75

127.60

126.91

131.29

132.91

137.33

180.95

186.21

192.22

195.08

196.97

200.59

204.38

207.2

208.98

210

216

222

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228

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High School Chemistry
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	331	<i>Properties of Matter and Thermochemistry</i>	6.4	A
2	331	<i>Atomic Structure and Periodicity</i>	2.2	A
3	332	<i>Solutions, Equilibrium and Acid Base Theory</i>	7.4	D
4	333	<i>Bonding and Reactions</i>	5.1	C
5	333	<i>Atomic Structure and Periodicity</i>	2.2	C
6	334	<i>Properties of Matter and Thermochemistry</i>	1.1	A
7	335	<i>Properties of Matter and Thermochemistry</i>	6.1	D
8	335	<i>Atomic Structure and Periodicity</i>	2.4	B
9	335	<i>Solutions, Equilibrium and Acid Base Theory</i>	7.5	D
10	335	<i>Solutions, Equilibrium and Acid Base Theory</i>	8.1	B
11	336	<i>Solutions, Equilibrium and Acid Base Theory</i>	8.2	
12	337	<i>Properties of Matter and Thermochemistry</i>	6.3	B
13	337	<i>Bonding and Reactions</i>	4.2	A
14	338	<i>Atomic Structure and Periodicity</i>	2.7	A
15	338	<i>Bonding and Reactions</i>	8.4	A
16	339	<i>Solutions, Equilibrium and Acid Base Theory</i>	7.6	D
17	340	<i>Bonding and Reactions</i>	4.4	C
18	340	<i>Atomic Structure and Periodicity</i>	3.3	D
19	341	<i>Bonding and Reactions</i>	4.5	B
20	341	<i>Atomic Structure and Periodicity</i>	3.4	A
21	342	<i>Atomic Structure and Periodicity</i>	2.3	B
22	342	<i>Properties of Matter and Thermochemistry</i>	1.3	B
23	343	<i>Properties of Matter and Thermochemistry</i>	1.1	
24	344	<i>Atomic Structure and Periodicity</i>	2.6	C
25	344	<i>Atomic Structure and Periodicity</i>	2.1	A
26	344	<i>Bonding and Reactions</i>	4.6	D
27	345	<i>Properties of Matter and Thermochemistry</i>	6.2	C
28	346	<i>Properties of Matter and Thermochemistry</i>	6.2	A
29	347	<i>Bonding and Reactions</i>	4.1	D
30	347	<i>Solutions, Equilibrium and Acid Base Theory</i>	7.1	B
31	347	<i>Bonding and Reactions</i>	5.5	D
32	347	<i>Properties of Matter and Thermochemistry</i>	6.5	B
33	348	<i>Bonding and Reactions</i>	5.2	
34	349	<i>Solutions, Equilibrium and Acid Base Theory</i>	8.3	A
35	349	<i>Solutions, Equilibrium and Acid Base Theory</i>	7.2	B
36	349	<i>Properties of Matter and Thermochemistry</i>	1.2	B
37	350	<i>Properties of Matter and Thermochemistry</i>	6.3	A
38	350	<i>Bonding and Reactions</i>	5.6	C
39	350	<i>Atomic Structure and Periodicity</i>	3.2	B
40	351	<i>Atomic Structure and Periodicity</i>	2.5	A

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
41	351	<i>Bonding and Reactions</i>	4.3	B
42	352	<i>Solutions, Equilibrium and Acid Base Theory</i>	7.3	A
43	352	<i>Properties of Matter and Thermochemistry</i>	6.1	C
44	353	<i>Atomic Structure and Periodicity</i>	3.1	
45	354	<i>Bonding and Reactions</i>	5.3	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

XX. Introductory Physics, High School

High School Introductory Physics Test

The spring 2012 high school Introductory Physics test was based on learning standards in the Physics content strand of the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). These learning standards appear on pages 74–77 of the *Framework*.

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Introductory Physics test results are reported under the following four MCAS reporting categories:

- Motion and Forces
- Heat and Heat Transfer
- Waves and Radiation
- Electromagnetism

Test Sessions

The high school Introductory Physics test included two separate test sessions, which were administered on consecutive days. Each session included multiple-choice and open-response questions.

Reference Materials and Tools

Each student taking the high school Introductory Physics test was provided with an Introductory Physics Formula Sheet. A copy of this formula sheet follows the final question in this chapter.

Each student also had sole access to a calculator with at least four functions and a square-root key.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Introductory Physics test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The table at the conclusion of this chapter indicates each item's reporting category and the framework learning standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

Introductory Physics

SESSION 1

DIRECTIONS

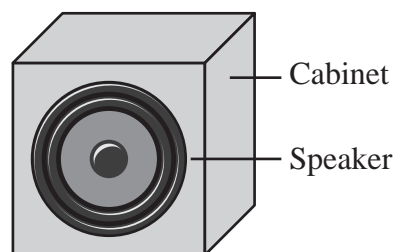
This session contains twenty-one multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 1 A rock is dropped from a window 5 m above the ground. The rock hits the ground 1.0 s later with a speed of 10 m/s.

What is the average speed of the rock during this time?

- A. 5 m/s
- B. 8 m/s
- C. 15 m/s
- D. 50 m/s

- 2 The picture below shows a sound speaker in a cabinet with its front panel removed.



When music plays through the speaker, the speaker rapidly moves back and forth in the cabinet. Which of the following conclusions is **best** supported by this observation?

- A. Sound travels only in air.
- B. Sound is a transverse wave.
- C. Sound is a longitudinal wave.
- D. Sound travels at the speed of light.

- 3 A person pushes a heavy cabinet across a level wooden floor. Force X is the force required to start the cabinet moving. Force Y is the force required to maintain a slow, steady forward motion.

Which of the following statements describes the two forces, X and Y?

- A. Force X is added to force Y.
- B. Force X is less than force Y.
- C. Force X is unrelated to force Y.
- D. Force X is greater than force Y.

- 4 Which of the following statements **best** describes a difference between mechanical waves and electromagnetic waves?

- A. Mechanical waves can produce colored light, while electromagnetic waves cannot.
- B. Mechanical waves can travel in any direction, while electromagnetic waves travel only in one direction.
- C. Mechanical waves travel only through a medium, while electromagnetic waves can also travel through a vacuum.
- D. Mechanical waves travel only at the speed of light, while electromagnetic waves can travel at many different speeds.

- 5 According to Newton's law of universal gravitation, in which of the following situations does the gravitational attraction between two bodies **always** increase?

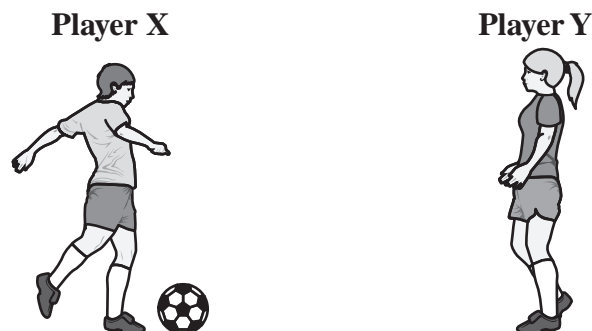
- A. The masses increase, and the distance between the centers of mass increases.
- B. The masses increase, and the distance between the centers of mass decreases.
- C. The masses decrease, and the distance between the centers of mass increases.
- D. The masses decrease, and the distance between the centers of mass decreases.

- 6 A student is sitting on the edge of a swimming pool. The student repeatedly dips his foot in and out of the pool, making waves that move across the water. The student dips his foot slowly at first and then does it faster, each time to the same depth.

Which of the following properties of the waves **increases** as the student dips his foot faster?

- A. frequency
- B. period
- C. velocity
- D. wavelength

- 7 Two soccer players, X and Y, are kicking a ball back and forth to each other, as shown below.



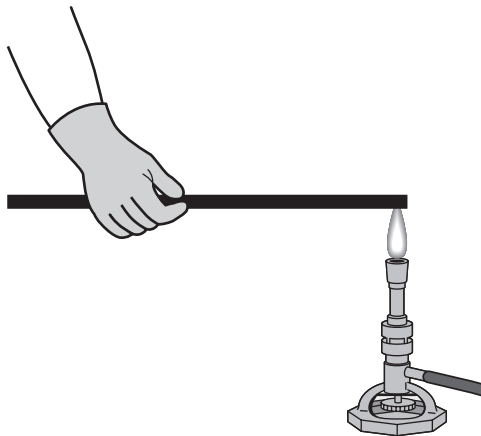
The table below shows the distance and direction the ball moves after each of four kicks.

Kick	Player	Distance and Direction
1	X	5 m right
2	Y	4 m left
3	X	6 m right
4	Y	5 m left

What is the total displacement of the ball and the total distance traveled by the ball?

- A. The ball has a displacement of 2 m to the right and traveled a distance of 20 m.
- B. The ball has a displacement of 20 m to the right and traveled a distance of 2 m.
- C. The ball has a displacement of 9 m to the right and traveled a distance of 11 m.
- D. The ball has a displacement of 11 m to the right and traveled a distance of 9 m.

- 8 An iron bar is placed in a flame, as shown below, and is heated until the end glows.



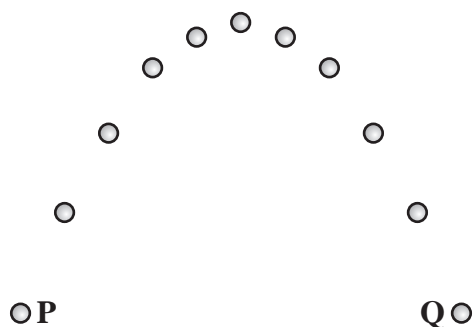
The other end of the iron bar soon becomes hot, too. Which of the following statements **best** describes what happens?

- A. A convective flow of energy is set up inside the iron bar.
- B. Energy is conducted from atom to atom along the length of the iron bar.
- C. Radiation moves through the iron bar and is absorbed by the end not in the flame.
- D. Air heated by the flame radiates down the iron bar and heats the end not in the flame.

- 9 An inventor claims to have designed a perpetual motion machine, a device that creates its own power. Which of the following laws **best** explains why a perpetual motion machine cannot work?

- A. law of conservation of energy
- B. law of conservation of matter
- C. Newton's second law
- D. Newton's third law

- 10 A ball is thrown upward at an angle from position P. The diagram below shows the position of the ball at equal time intervals as it moves from position P to position Q.



Which of the following causes the change in the ball's velocity as the ball travels from position P to position Q?

- A. decrease in its inertia
- B. increase in its momentum
- C. downward force of gravity
- D. initial acceleration upward

- 11 A battery is connected to a light bulb with copper wire to complete a circuit. The bulb immediately lights.

Which of the following **best** describes why the bulb lights?

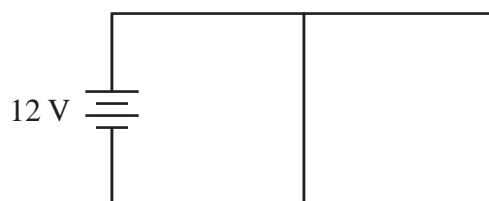
- A. The battery supplies electrons, which move through the bulb but not the wire.
- B. The battery supplies chemicals, which pass through the bulb to the end of the wire.
- C. The battery supplies heat energy, which causes the bulb to produce light energy.
- D. The battery supplies voltage, which causes electrons throughout the circuit to move.

Question 12 is an open-response question.

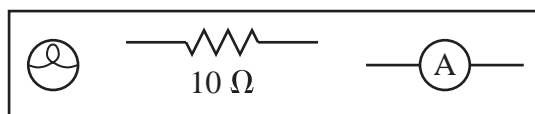
- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 12 in the space provided in your Student Answer Booklet.

- 12** The diagram below shows an incomplete parallel circuit and the components that will complete the circuit.



Circuit Components



- In your Student Answer Booklet, draw the parallel circuit using all the circuit components shown. Place the ammeter in the circuit so that it measures the total current of the circuit.
- Calculate the current flowing through the resistor. Show your calculations and include units in your answer.

When the circuit is operating, the ammeter measures a total current of 1.5 A.

- Determine the resistance of the light bulb. Show your calculations or explain your reasoning. Include units in your answer.
- Describe **one** change that would result if the light bulb and resistor were placed in series instead of in parallel.

Mark your answers to multiple-choice questions 13 through 22 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

- 13 A cup of tea with a temperature of 80°C is placed on a table in a 20°C room. What happens to the thermal energy and molecular motion of the tea when it is left on the table?

A. The thermal energy increases and the molecules move faster.
B. The thermal energy decreases and the molecules move faster.
C. The thermal energy increases and the molecules move more slowly.
D. The thermal energy decreases and the molecules move more slowly.

- 14 Which of the following statements explains why light is refracted as it moves from air into glass?

A. The speed of light decreases in glass.
B. The energy of light increases in glass.
C. The frequency of light decreases in glass.
D. The wavelength of light increases in glass.

- 15 A hand-held video game is powered by batteries. After playing the game for several minutes, a student notices that the game feels warm.

Which of the following is the **most likely** explanation for this observation?

A. The game creates energy when it is turned on.
B. Some of the energy from the batteries is changed to heat.
C. Some of the energy from the batteries is changed to friction.
D. The game receives heat energy from the person playing it.

16 An object with a mass of 3 kg has a momentum of $75 \text{ kg} \cdot \text{m/s}$. What is its velocity?

- A. 0.4 m/s
- B. 7.1 m/s
- C. 25 m/s
- D. 72 m/s

17 Which of the following actions would increase the electric force between two positively charged particles?

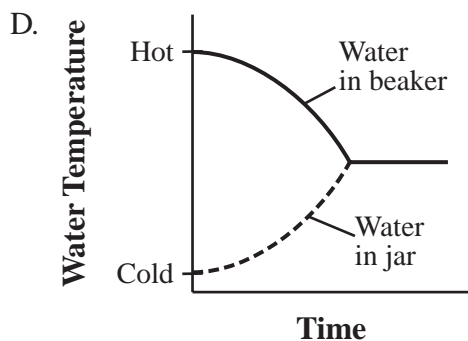
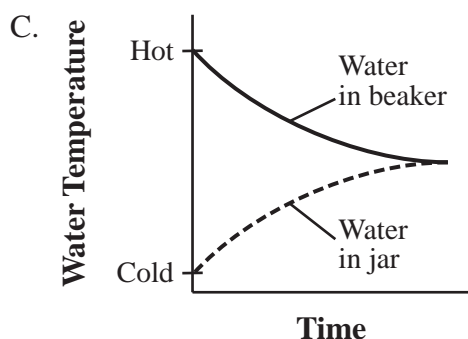
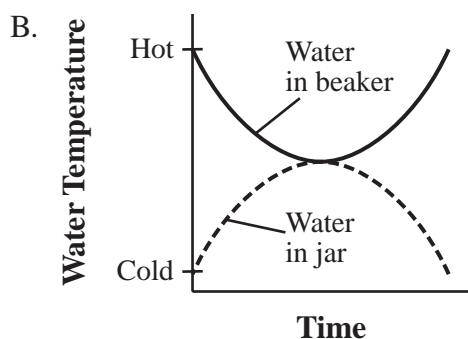
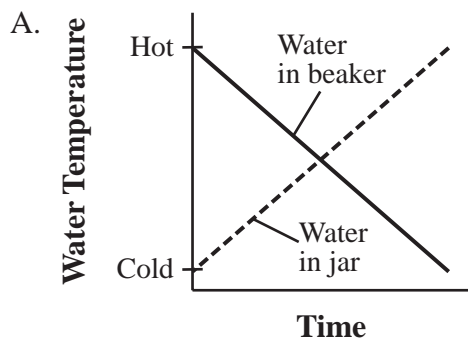
- A. decreasing the mass of the particles
- B. decreasing the distance between the particles
- C. changing the charges from positive to negative
- D. transferring all the charge from one particle to the other

- 18 A small body of water contains 2,000 kg of water. The specific heat of water is $4,180 \text{ J/kg} \cdot ^\circ\text{C}$.

If the temperature of the water changes from 25°C to 20°C , approximately how much heat moves from the water to the surroundings?

- A. 8,400,000 J
- B. 42,000,000 J
- C. 168,000,000 J
- D. 210,000,000 J

- 19 A sealed glass jar containing 200 mL of cold water is lowered into a large beaker containing 200 mL of hot water. Which of the following graphs shows how the temperature of each water sample will most likely change over time?



- 20 A 1000 kg automobile is traveling at an initial speed of 20 m/s. It is brought to a complete stop in 5 s over a distance of 50 m.

What is the work done in stopping the automobile?

- A. 10,000 J
B. 40,000 J
C. 50,000 J
D. 200,000 J

- 21 A rope is stretched horizontally between two students. One of the students shakes an end of the rope up and down. Which of the following terms **best** describes the type of wave that is produced?
- A. electromagnetic
 - B. longitudinal
 - C. rotational
 - D. transverse
- 22 The siren of a fire truck emits a certain pitch, which is heard by a nearby observer. In which of the following situations would the observer perceive the lowest frequency of sound?
- A. The observer and fire truck are both stationary.
 - B. The observer walks at 3 m/s toward the stationary fire truck.
 - C. The observer is stationary while the fire truck drives toward the observer at 15 m/s.
 - D. The observer is stationary while the fire truck drives away from the observer at 15 m/s.

Question 23 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 23 in the space provided in your Student Answer Booklet.

- 23** A 30.0 N force is continuously applied to the right on a 12.0 kg object. The object accelerates on a horizontal frictionless surface. After a certain amount of time, another force of 8.0 N is applied to the left on the object.
- Calculate the object's acceleration **before** the 8.0 N force is applied. Show your calculations and include units in your answer.
 - Calculate the object's acceleration **after** the 8.0 N force is applied. Show your calculations and include units in your answer.
 - Is the direction of acceleration in parts (a) and (b) the same or different? Explain your answer.

The object is then pushed onto a slightly rough surface that exerts an additional 20 N frictional force to the left on the object.

- Will the object come to rest on the slightly rough surface? Explain your answer.

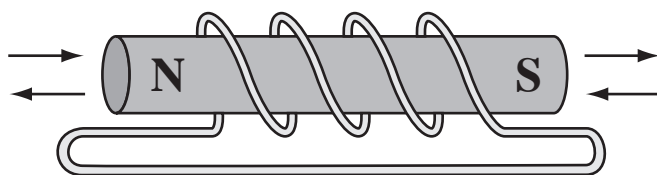
Introductory Physics

SESSION 2

DIRECTIONS

This session contains nineteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 24 The diagram below shows a bar magnet within a coil of conducting wire. The magnet is moved back and forth. The magnet never has contact with the wire.



As the magnet is moved, the wire will

- A. decrease in temperature.
- B. become negatively charged.
- C. demagnetize the bar magnet.
- D. have an electric current.

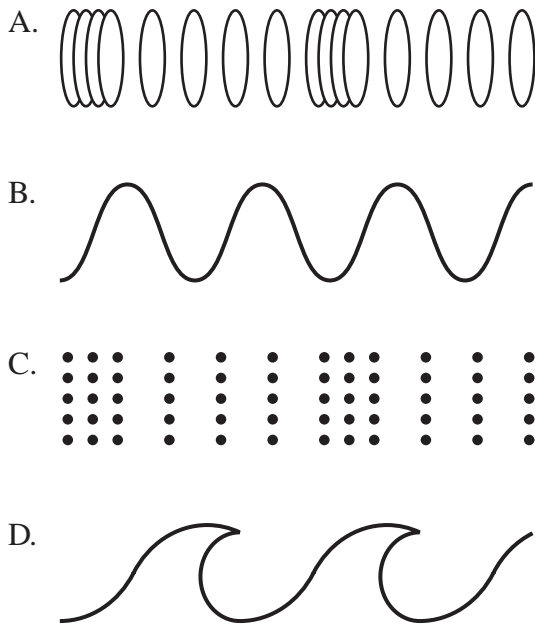
- 25 The table below provides information about the daily use of some typical appliances.

Appliance	Power Rating (W)	Duration of Use (hr)
dishwasher	1500	0.5
air conditioner	1000	1.0
laptop computer	50	12.0
clock radio	1	24.0

Which appliance uses the most energy?

- A. dishwasher
- B. air conditioner
- C. laptop computer
- D. clock radio

- 26 Which of the following **best** represents an electromagnetic wave?



- 27 A simple circuit has a current of 3.0 A and a resistance of 5.0 Ω . What is the voltage supplied by the battery of this circuit?

A. 0.60 V
B. 1.7 V
C. 8.0 V
D. 15.0 V

- 28 While playing a game at a fair, a person lifts a mallet above her head. She then lets the mallet fall toward a target, as shown below.



Which of the following statements describes an energy change that takes place as the person lifts the mallet and then lets it fall toward the target?

- A. Kinetic energy increases as the mallet reaches its highest point.
B. Potential energy decreases as the mallet reaches its highest point.
C. Kinetic energy converts to potential energy as the mallet falls toward the target.
D. Potential energy converts to kinetic energy as the mallet falls toward the target.

- 29 Student X and student Y are receiving sound waves from a stationary source. The sound waves have a frequency of 10 kHz. Student X is stationary and student Y is traveling toward the source of the sound waves.

Which of the following statements describes what will happen as student Y moves?

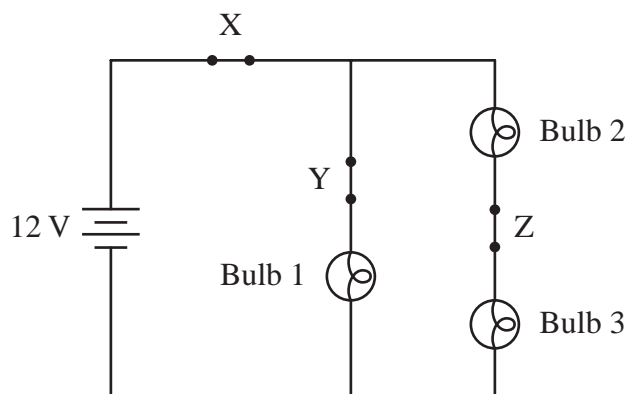
- A. Student X will receive sound waves with a frequency higher than 10 kHz.
- B. Student X will receive sound waves with a frequency lower than 10 kHz.
- C. Student Y will receive sound waves with a frequency higher than 10 kHz.
- D. Student Y will receive sound waves with a frequency lower than 10 kHz.

- 30 A student rubs a glass rod with a piece of cloth and rubs a plastic ruler with a different piece of cloth. The glass rod becomes positively charged, and the ruler becomes negatively charged.

Which of the following statements describes the **most likely** result when the two pieces of cloth are brought close to each other?

- A. The pieces of cloth repel each other.
- B. The pieces of cloth attract each other.
- C. A continuous current flows between the pieces of cloth.
- D. There is no electric interaction between the pieces of cloth.

- 31 The diagram below shows an electrical circuit with three bulbs and three switches. The switches are labeled X, Y, and Z. When all three switches are closed, as shown, all three bulbs are lit.



Which of the following statements describes what will happen if switch Z is opened?

- A. Only bulb 1 will be lit.
- B. Only bulb 3 will be lit.
- C. All three bulbs will be lit.
- D. None of the bulbs will be lit.

Question 32 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 32 in the space provided in your Student Answer Booklet.

32 When fireworks explode, they create light waves and sound waves. An investigation is performed to study the differences between the two types of waves. Three cameras capable of recording audio and video are set up at safe nearby locations in clear view of the fireworks.

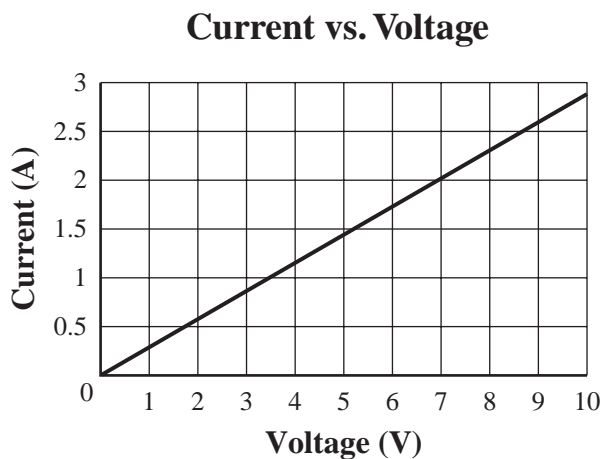
- Camera 1 is placed in an open field.
 - Camera 2 is placed in a vacuum-sealed glass container.
 - Camera 3 is placed behind sheets of polarizing glass that block electromagnetic waves.
- a. Identify whether audio only, video only, or both audio and video of the fireworks will be recorded by **each** camera.
- b. Explain **each** of your answers for part (a).

Suppose a camera records both audio and video.

- c. Will the light or the sound from the fireworks be recorded first? Explain your answer.

Mark your answers to multiple-choice questions 33 through 43 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

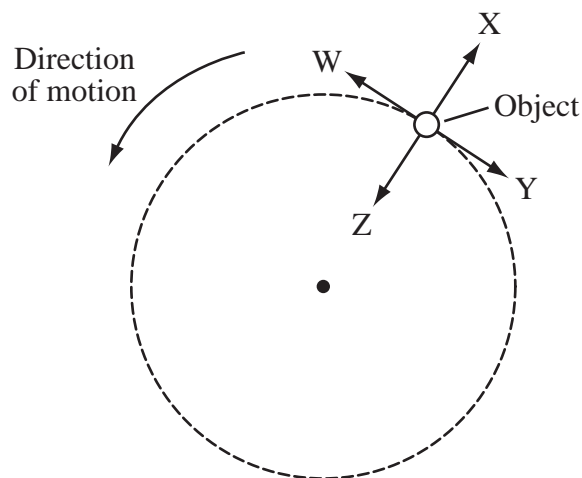
- 33 The graph below shows the relationship between current and voltage in a circuit. Resistance in the circuit remains constant.



What is the resistance of this circuit?

- A. $0.3 \, \Omega$
- B. $2.5 \, \Omega$
- C. $3.5 \, \Omega$
- D. $30 \, \Omega$

- 34 The diagram below shows an object traveling at a constant speed in a circular path.



Which labeled arrow represents the centripetal force acting on the object?

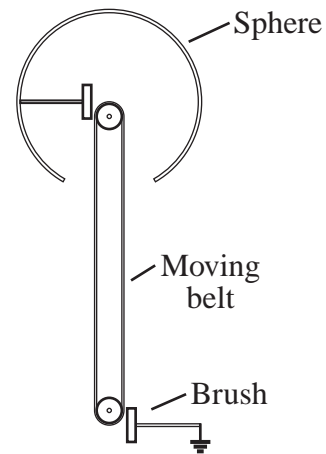
- A. W
- B. X
- C. Y
- D. Z

- 35 Popcorn is made by heating corn kernels. Different methods may be used to heat the kernels.

Which of the following methods uses radiation as the primary means of transferring energy to the corn kernels?

- A. heating corn kernels in a hot air popper
- B. heating corn kernels in a microwave oven
- C. heating corn kernels in a foil pan on a hot plate
- D. heating corn kernels in oil in a pot on an electric stove

- 36 The diagram below shows the inside of a Van de Graaff generator.

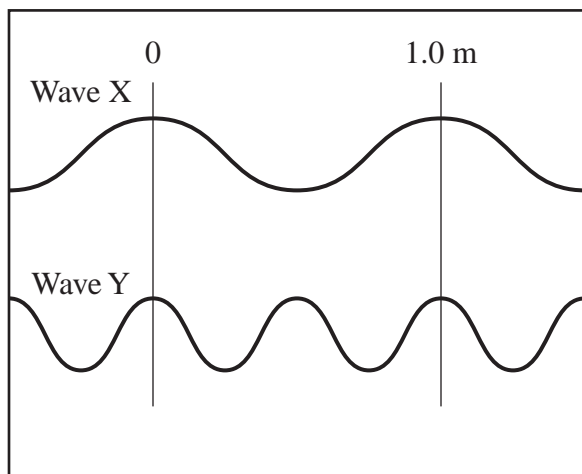


A net charge can be built up on the generator's sphere. A moving belt removes charged particles from the sphere and deposits them on the brush. Charged particles flow freely over the surface of the sphere, but do not move on the belt.

The generator could be made from which of the following?

- A. a copper belt and a plastic sphere
- B. a rubber belt and a plastic sphere
- C. a copper belt and an aluminum sphere
- D. a rubber belt and an aluminum sphere

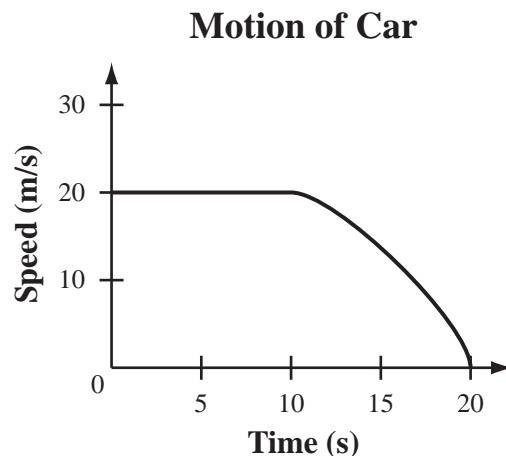
- 37 Two waves traveling in the same medium are shown below.



Which of the following correctly compares the two waves?

- A. Wave X has half the amplitude of wave Y.
- B. Wave X has twice the amplitude of wave Y.
- C. Wave X has a lower frequency and longer wavelength than wave Y.
- D. Wave X has a higher frequency and shorter wavelength than wave Y.

- 38 The graph below represents the motion of a car as it moves along a straight road for 20 s.



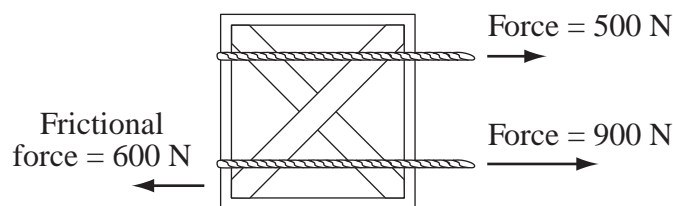
Which statement **best** describes the motion of the car over the 20 s?

- A. The car is initially at rest and then backs up for 10 s.
- B. The car moves 20 m in the first 10 s and then stops.
- C. The car travels at a constant speed for 10 s and then decelerates until it stops.
- D. The car travels at a constant speed of 20 m/s and then decelerates until it is traveling at a constant speed of 15 m/s.

- 39 A 20 kg child is traveling 3 m/s on an amusement park ride. What is the magnitude of the child's momentum?

A. $6.7 \text{ kg} \cdot \text{m/s}$
B. $60 \text{ kg} \cdot \text{m/s}$
C. $90 \text{ kg} \cdot \text{m/s}$
D. $200 \text{ kg} \cdot \text{m/s}$

- 40 A crate is being pulled along a floor by means of two ropes. A frictional force opposes the motion of the crate. The diagram below shows these three forces acting on the crate.



What is the magnitude of the net force acting on the crate?

A. 800 N
B. 1000 N
C. 1400 N
D. 2000 N

- 41 Ultraviolet and x-ray radiation can damage human cells. Which of the following is a property of these two forms of radiation?

A. low wave speed
B. short wavelength
C. low wave frequency
D. small wave amplitude

- 42 In which of the following media do sound waves **most likely** travel the fastest?

A. crude oil
B. distilled water
C. solid steel
D. warm air

- 43 A car is moving at 25 m/s north. Which of the following is a vector quantity?

A. the speed of the car
B. the velocity of the car
C. the potential energy of the car
D. the distance traveled by the car

Questions 44 and 45 are open-response questions.

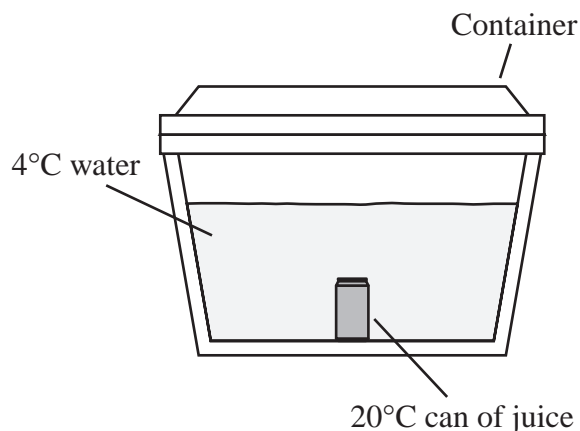
- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 44 in the space provided in your Student Answer Booklet.

- 44** A student lifts a 10.0 kg box from the floor at a constant speed to a shelf that is 1.5 m above the floor.
- Construct a free-body force diagram that represents the forces acting on the box when it is 1.0 m above the floor. Be sure to label your diagram.
 - Explain how you know that work is being done on the box, and how the work results in a change in the energy of the box.
 - Calculate the amount of work done on the box and the change in potential energy of the box. Show your calculations and include units in your answer.

Write your answer to question 45 in the space provided in your Student Answer Booklet.

- 45 A can of juice at 20°C is completely submerged in a closed, insulated container filled with water at 4°C , as shown in the diagram below.



- Describe what happens to the temperature of the can of juice **and** the temperature of the water in the container within the first few minutes after the can is submerged. Explain your answer.
- After four hours, will the can and the water have the same temperature or different temperatures? Explain your answer.
- Estimate the numerical value(s) of the final temperatures of the can of juice and the water after four hours. Explain your answer.

Massachusetts Comprehensive Assessment System

Introductory Physics Formula Sheet

Formulas

$$\text{Average Speed} = \frac{d}{\Delta t}$$

$$F = ma$$

$$p = mv$$

$$\text{Average Acceleration} = \frac{\Delta v}{\Delta t}$$

$$F = G \frac{m_1 m_2}{d^2}$$

$$V = IR$$

$$\text{Average Velocity} = \frac{\Delta x}{\Delta t}$$

$$F = k \frac{q_1 q_2}{d^2}$$

$$P = IV$$

$$v_f = v_i + a\Delta t$$

$$KE = \frac{1}{2}mv^2$$

$$Q = mc\Delta T$$

$$\Delta x = v_i \Delta t + \frac{1}{2}a \Delta t^2$$

$$PE = mg\Delta h$$

$$v = f\lambda$$

$$v_f^2 = v_i^2 + 2a\Delta x$$

$$W = Fd$$

$$\lambda = \frac{c}{f}$$

$$\text{Average Velocity} = \frac{v_i + v_f}{2}$$

$$P = \frac{W}{\Delta t}$$

$$T = \frac{1}{f}$$

Variables

a = acceleration	q = charge of particle
c = specific heat	Q = heat
d = distance	R = resistance
f = frequency	Δt = change in time
F = force	ΔT = change in temperature
Δh = change in height	T = period
I = current	v = velocity
KE = kinetic energy	v_i = initial velocity
λ = wavelength	v_f = final velocity
m = mass	Δv = change in velocity
p = momentum	V = voltage
P = power	W = work
PE = gravitational potential energy	Δx = displacement

Definitions

$$c = \text{speed of electromagnetic waves} = 3.00 \times 10^8 \text{ m/s}$$

$$G = \text{Universal gravitational constant} = 6.67 \times 10^{-11} \frac{\text{N} \cdot \text{m}^2}{\text{kg}^2}$$

$$k = \text{Coulomb constant} = 8.99 \times 10^9 \frac{\text{N} \cdot \text{m}^2}{\text{C}^2}$$

$$g \approx 10 \text{ m/s}^2 \quad 1 \text{ N} = 1 \frac{\text{kg} \cdot \text{m}}{\text{s}^2} \quad 1 \text{ J} = 1 \text{ N} \cdot \text{m} \quad 1 \text{ W (watt)} = 1 \frac{\text{J}}{\text{s}}$$

High School Introductory Physics
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	361	<i>Motion and Forces</i>	1.2	A
2	361	<i>Waves and Radiation</i>	4.3	C
3	362	<i>Motion and Forces</i>	1.6	D
4	362	<i>Waves and Radiation</i>	4.2	C
5	363	<i>Motion and Forces</i>	1.7	B
6	363	<i>Waves and Radiation</i>	4.1	A
7	363	<i>Motion and Forces</i>	1.2	A
8	364	<i>Heat and Heat Transfer</i>	3.1	B
9	364	<i>Motion and Forces</i>	2.1	A
10	365	<i>Motion and Forces</i>	1.4	C
11	365	<i>Electromagnetism</i>	5.5	D
12	366	<i>Electromagnetism</i>	5.3	
13	367	<i>Heat and Heat Transfer</i>	3.3	D
14	367	<i>Waves and Radiation</i>	4.4	A
15	367	<i>Motion and Forces</i>	2.1	B
16	368	<i>Motion and Forces</i>	2.5	C
17	368	<i>Electromagnetism</i>	5.4	B
18	369	<i>Heat and Heat Transfer</i>	3.4	B
19	370	<i>Heat and Heat Transfer</i>	3.2	C
20	370	<i>Motion and Forces</i>	2.3	D
21	371	<i>Waves and Radiation</i>	4.3	D
22	371	<i>Waves and Radiation</i>	4.6	D
23	372	<i>Motion and Forces</i>	1.4	
24	373	<i>Electromagnetism</i>	5.6	D
25	373	<i>Motion and Forces</i>	2.4	B
26	374	<i>Waves and Radiation</i>	6.1	B
27	374	<i>Electromagnetism</i>	5.2	D
28	374	<i>Motion and Forces</i>	2.2	D
29	375	<i>Waves and Radiation</i>	4.6	C
30	375	<i>Electromagnetism</i>	5.1	B
31	375	<i>Electromagnetism</i>	5.3	A
32	376	<i>Waves and Radiation</i>	4.2	
33	377	<i>Electromagnetism</i>	5.2	C
34	377	<i>Motion and Forces</i>	1.8	D
35	378	<i>Heat and Heat Transfer</i>	3.1	B
36	378	<i>Electromagnetism</i>	5.1	D
37	379	<i>Waves and Radiation</i>	4.1	C
38	379	<i>Motion and Forces</i>	1.3	C
39	380	<i>Motion and Forces</i>	2.5	B

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
40	380	<i>Motion and Forces</i>	1.5	A
41	380	<i>Waves and Radiation</i>	6.2	B
42	380	<i>Waves and Radiation</i>	4.5	C
43	380	<i>Motion and Forces</i>	1.1	B
44	381	<i>Motion and Forces</i>	2.3	
45	382	<i>Heat and Heat Transfer</i>	3.2	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.

XXI. Technology/Engineering, High School

High School Technology/Engineering Test

The spring 2012 high school Technology/Engineering test was based on learning standards in the Technology/Engineering content strand of the Massachusetts *Science and Technology/Engineering Curriculum Framework* (2006). These learning standards appear on pages 92–95 of the *Framework*.

The *Science and Technology/Engineering Curriculum Framework* is available on the Department website at www.doe.mass.edu/frameworks/current.html.

Technology/Engineering test results are reported under the following four MCAS reporting categories:

- Engineering Design
- Construction and Manufacturing
- Fluid and Thermal Systems
- Electrical and Communications Systems

Test Sessions

The high school Technology/Engineering test included two separate test sessions, which were administered on consecutive days. Each session included multiple-choice and open-response questions.

Reference Materials and Tools

Each student taking the high school Technology/Engineering test was provided with a plastic ruler and a Technology/Engineering Formula Sheet. A copy of this formula sheet follows the final question in this chapter. An image of the ruler is not reproduced in this publication.

Each student also had sole access to a calculator with at least four functions and a square-root key.

The use of bilingual word-to-word dictionaries was allowed for current and former English language learner students only, during both Technology/Engineering test sessions. No other reference tools or materials were allowed.

Cross-Reference Information

The table at the conclusion of this chapter indicates each item's reporting category and the framework learning standard it assesses. The correct answers for multiple-choice questions are also displayed in the table.

Technology/Engineering

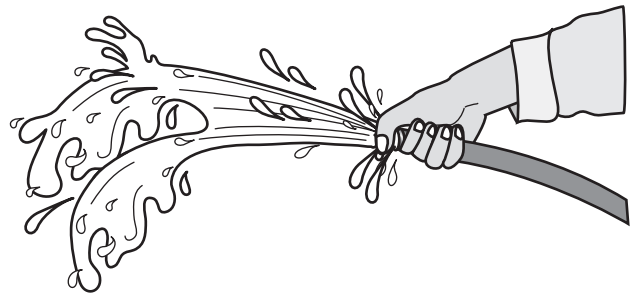
SESSION 1

DIRECTIONS

This session contains twenty-one multiple-choice questions and two open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 1 Juan is going to design a kite for mass production. After doing research, Juan creates several different designs and selects the one he wants to use.
- What are the next two steps Juan should do in the design process?
- A. Build and finish full-sized kites.
 - B. Redesign the kite and evaluate it.
 - C. Build a prototype of the kite and test it.
 - D. Patent the kite design and sell it to others.

- 2 A person is using a 1 in. diameter garden hose to wash his bike. The hose does not have a nozzle. To make the water spray, the person covers part of the hose opening with his thumb, as shown below.



After the person sprays the bike, he drops the hose to the ground. Which of the following statements describes the water coming out of the hose on the ground compared to when the person covered part of the hose opening?

- A. The density of the water is now less.
- B. The density of the water is now greater.
- C. The velocity of the water is now faster.
- D. The velocity of the water is now slower.

- 3 The thermal system of an office building should be designed to provide for the thermal comfort of the building occupants. To design the thermal system, an engineer first examines the interior environmental factors of the building.

Which of the following do **not** have a relationship that directly affects the interior environmental conditions of a building?

- A. total dead load and conduction
- B. average ceiling height and convection
- C. R-value of wall material and conduction
- D. number of windows per floor and radiation

- 4 The drawing below shows a doghouse.



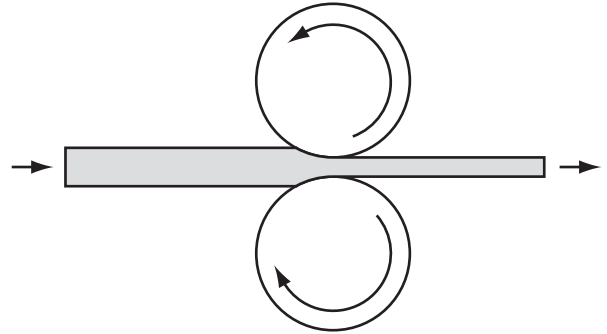
The roof area of this doghouse is 10 square feet. The doghouse is covered with a layer of snow that is 0.25 feet deep.

If the density of the snow is 6 lbs. per cubic foot, which of the following is the **best** estimate of the snow load on the doghouse?

- A. 10 lbs.
- B. 15 lbs.
- C. 25 lbs.
- D. 60 lbs.

- 5 Which of the following statements describes an advantage of total internal reflection within an optical fiber?
- A. It converts electrical signals into optical signals.
 - B. It converts optical signals into electrical signals.
 - C. It allows optical signals to be transmitted along a curved path.
 - D. It allows electrical signals to be transmitted along a curved path.

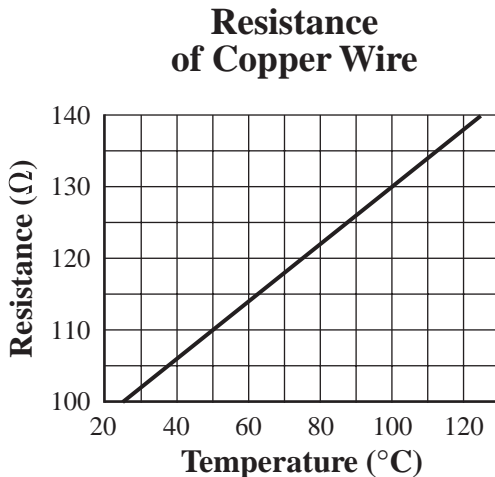
- 6 In the illustration below, a thick sheet of metal is being passed through two large rollers to produce a thinner sheet.



Which type of manufacturing process is being used?

- A. casting
- B. forming
- C. molding
- D. separating

- 7 The resistance of a coil of copper wire changes as the wire's temperature changes, as shown in the graph below.



What is the current at 50°C if the voltage is 12 V?

- A. 0.11 A
- B. 9.2 A
- C. 110 A
- D. 1320 A

- 8 A data encryption service developed in the early 1990s enabled a person to send e-mail that could not be opened by a third party. Over the years, this system has been improved and is now used in a variety of applications.

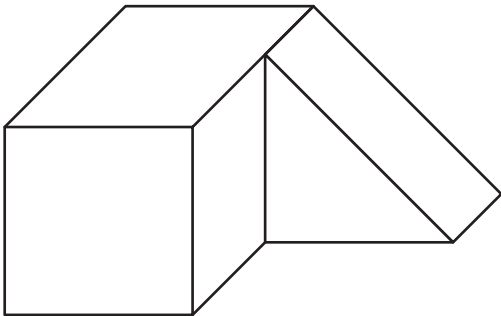
Which of the following statements describes a way this encryption service is used today?

- A. Individuals use it to prevent identity theft.
- B. Internet businesses use it to advertise via e-mail.
- C. Government agencies use it to regulate website fees.
- D. Designers of online games use it to enhance graphics.

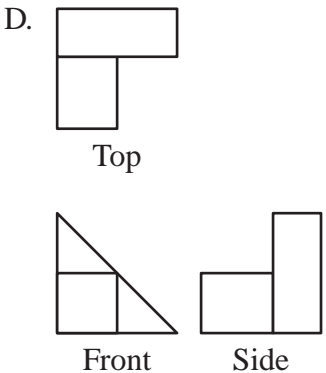
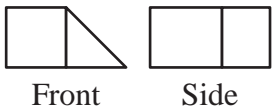
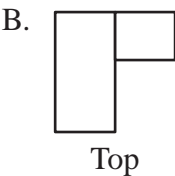
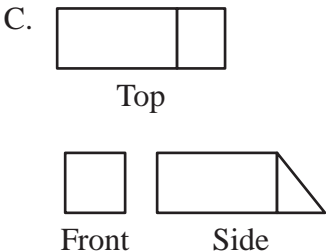
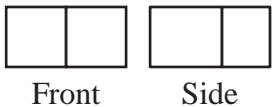
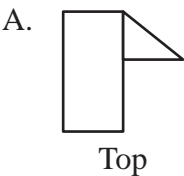
- 9 Which of the following statements **best** compares direct current (DC) and alternating current (AC)?

- A. AC flows in only one direction, and DC flows in both directions.
- B. DC flows in only one direction, and AC flows in both directions.
- C. AC comes directly from a power plant, and DC comes from a magnetic field.
- D. DC can maintain a constant voltage over time, and AC loses voltage over time.

10 A wooden part is shown below.



Which of the following orthographic projections best represents this part?

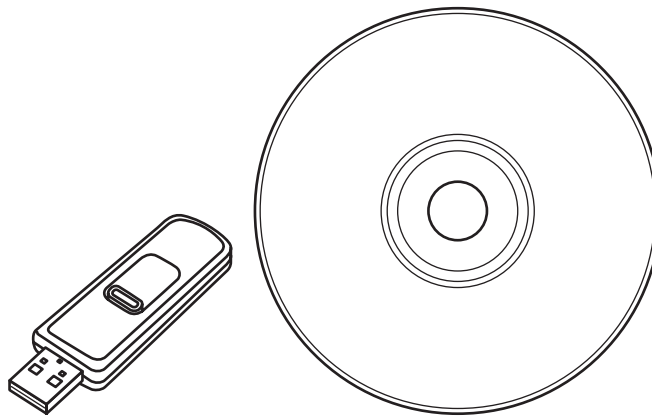


Question 11 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF THE QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 11 in the space provided in your Student Answer Booklet.

- 11** The diagrams below show a USB flash drive and a compact disc (CD).



USB flash drive

Compact disc

Both USB flash drives and CDs are very durable compared to previous storage devices. USB flash drives have replaced CDs for many applications.

Describe **four** advantages of using USB flash drives rather than CDs to transfer data.

Mark your answers to multiple-choice questions 12 through 22 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

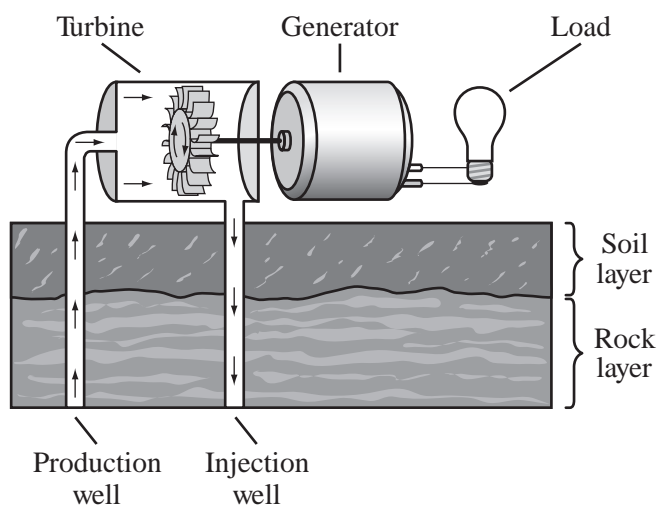
- 12 Which of the following explains why a sprinkler system is considered an open fluid system?

A. It uses water instead of air.
B. It allows water to evaporate.
C. It allows water to leave the system.
D. It recycles all the water within the system.

- 13 Which of the following explains why tinting office building windows is an effective way to reduce air-conditioning costs in the summer months?

A. Tinting absorbs heat from the inside of the building.
B. Tinting forces workers to use artificial lighting inside the building.
C. Tinting reduces the amount of solar radiation that passes into the building.
D. Tinting creates a thermal barrier that prevents heat from leaving the building.

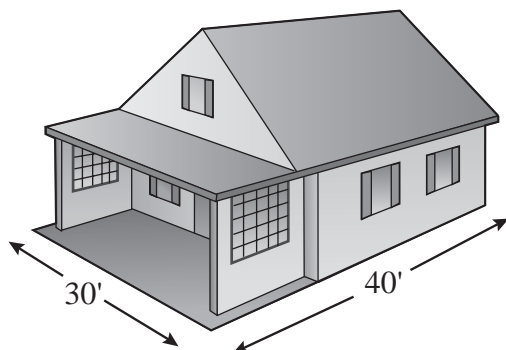
- 14 The diagram below shows one system that can be used to generate electricity.



Which of the following renewable energy sources is being used to power this system?

A. geothermal energy
B. solar energy
C. water energy
D. wind energy

- 15 The diagram below represents a house.



An architect needs to produce a scale drawing of the first-floor plan of this house on a sheet of $8\frac{1}{2}'' \times 11''$ paper. Which of the following scales will allow the architect to make the largest drawing possible on one sheet of paper?

- A. $1'' = 1'$
- B. $\frac{1}{2}'' = 1'$
- C. $\frac{1}{4}'' = 1'$
- D. $\frac{1}{8}'' = 1'$

- 16 Which of the following best describes how information is coded in an analog signal?
- A. by blinking visible light for different durations
 - B. by generating square waves consisting of ones and tens
 - C. by varying the amplitude and frequency of electromagnetic waves
 - D. by alternating electrical current between zero and a positive voltage

- 17 In the early twentieth century, a person in Boston, Massachusetts, who wanted to send a message to someone in San Francisco, California, gave the message to a telegraph operator. The operator tapped the message in Morse code, and the message was relayed through electrical cables to San Francisco. In San Francisco, an operator translated the signal into English and had it delivered to the address specified.

Which of the following describes the encoding process of telegraph communication?

- A. giving the message to the operator
- B. tapping the message in Morse code
- C. translating the Morse code message
- D. delivering the message to the address

- 18 A group of students is going to design and build a new set of shelves for a school. Which of the following describes the **first** steps of the design process that the students need to do?

- A. Draw a diagram of the shelf design on the computer, select the materials, and build the shelves.
- B. Find out why the shelves are needed, research current options, and brainstorm possible solutions.
- C. Measure the space for the shelves, select the possible materials, and get prices for the materials proposed for use.
- D. Brainstorm some ideas for the shelves, use the computer to design the shelves, and find the strongest materials to build the shelves.

- 19 The foundation of a building carries the weight of the structure above it. Which of the following is the primary type of force on the foundation?

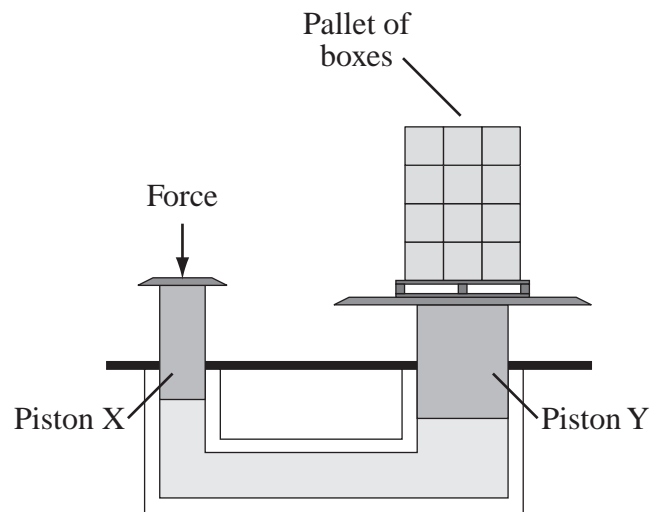
- A. compression
- B. friction
- C. shear
- D. torsion

- 20 For safety, a person using a power tool should comply with which of the following rules?
- A. Cut power by pulling on the electrical cord.
 - B. Use the tool only for the specific task the tool is designed to do.
 - C. Wear loose, baggy clothing that completely covers any exposed skin.
 - D. Make sure the power switch is set to ON before plugging the tool in.

- 21 Which of the following statements explains why hydraulic systems are generally more efficient than pneumatic systems?

- A. Hydraulic fluid is not corrosive, whereas pneumatic fluid is corrosive.
- B. Hydraulic fluid is incompressible, whereas pneumatic fluid is compressible.
- C. Hydraulic fluid has a low density and pressure, whereas pneumatic fluid has a high density and pressure.
- D. Hydraulic fluid takes the shape of its container, whereas pneumatic fluid does not take the shape of its container.

- 22 The diagram below represents a hydraulic system.



When a force of 1700 lb. is applied to piston X, the 6800 lb. pallet of boxes moves upward. The hydraulic system serves as which of the following?

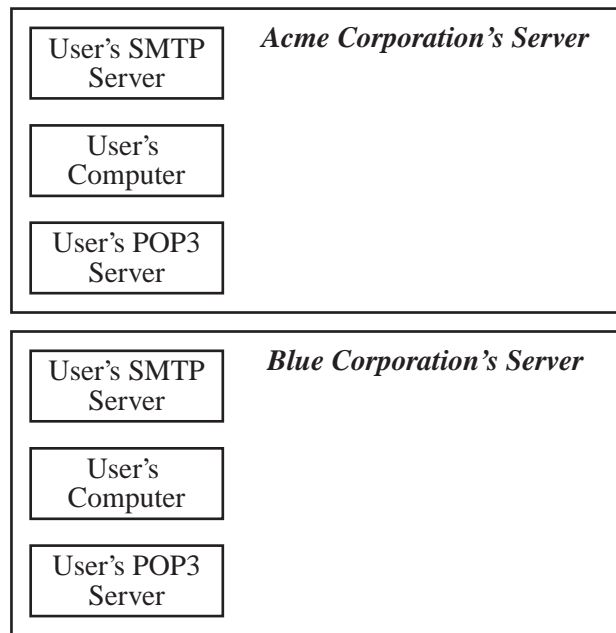
- A. area multiplier
- B. direction stabilizer
- C. force multiplier
- D. force stabilizer

Question 23 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 23 in the space provided in your Student Answer Booklet.

- 23** Many e-mail messages are sent through systems similar to the one outlined in the diagram below.



An SMTP server sends messages from its users and receives messages from other servers. A POP3 server holds a user's incoming messages until the user reads them.

- a. Copy the diagram into your Student Answer Booklet. On your diagram, add arrows to show the path of an e-mail sent from a user's computer at the Acme Corporation to a user's computer at the Blue Corporation.

A communication system can be made up of the following components: decoder, destination, encoder, receiver, retrieval, source, storage, and transmitter.

- b. Identify the part of a communication system represented by the user's computer at the Blue Corporation. Explain your answer.
- c. Identify the part(s) of a communication system represented by the POP3 servers. Explain your answer.

Technology/Engineering

SESSION 2

DIRECTIONS

This session contains nineteen multiple-choice questions and three open-response questions. Mark your answers to these questions in the spaces provided in your Student Answer Booklet. You may work out solutions to multiple-choice questions in the test booklet.

- 24 The table below shows R-values of several insulation materials.

Material	R/Inch
cellulose	3.70
fiberglass batting	3.20
rigid fiberglass	4.00
rock wool	3.03

Heat is lost from a building by conduction. Which material would be **best** to help prevent heat loss from a 4.5 in. thick wall?

- A. cellulose
- B. fiberglass batting
- C. rigid fiberglass
- D. rock wool

- 25 Solar photovoltaic energy is useful as a portable power source for items such as calculators. In a solar photovoltaic system, sunlight is directly converted into which of the following?

- A. heat
- B. electricity
- C. nuclear energy
- D. chemical energy

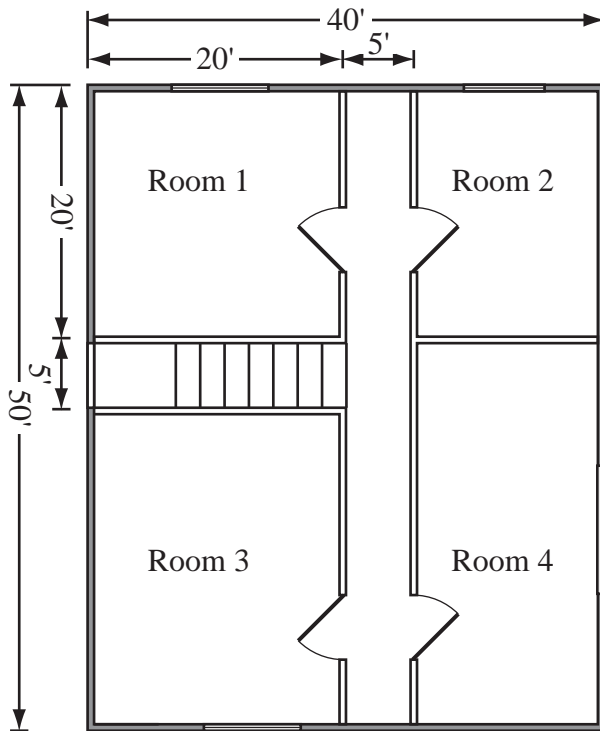
- 26 Which of the following types of systems most likely uses fluid under high pressure to operate?

- A. hydraulic
- B. thermal
- C. ventilation
- D. wastewater

- 27 Which of the following statements **best** describes how fiber optics is used to transmit information?

- A. Pulses of light are used to transmit digital information.
- B. Pulses of electricity are used to transmit digital information.
- C. Varying light frequencies are used to transmit analog information.
- D. Varying radio frequencies are used to transmit analog information.

- 28 The diagram below shows the second-floor plan of a house.



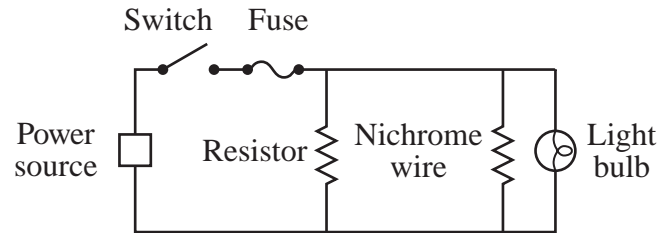
The builder will make the room with the largest square footage into the master bedroom. Which room will become the master bedroom?

- A. room 1
- B. room 2
- C. room 3
- D. room 4

- 29 Which of the following describes the winter conditions that would result in a home having the **highest** rate of heat loss to the outside environment?

A. a cloudy, calm day
B. several inches of snow on the roof
C. rows of icicles along the window awnings
D. a strong, steady wind blowing from the northwest

- 30 The circuit shown below consists of a power source, a switch, a fuse, a resistor, nichrome wire, and a light bulb.



When the power is on and the switch is closed, the light bulb does not light. Which of the following is the **most likely** explanation for why the light bulb does not light in this circuit?

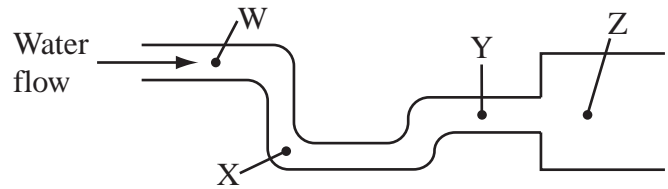
- A. The switch should be in the open position.
B. The nichrome wire does not conduct electricity.
C. The current flowing through the circuit has exceeded the rating of the fuse.
D. The placement of the resistor has created too much resistance in the circuit.

- 31 A teacher performs an experiment for a group of students. The teacher uses long, thin copper wires to connect a battery to a small light bulb. The teacher then applies heat to the copper wires. The students observe that the light bulb becomes dimmer. As the wires cool, the students observe that the light bulb becomes bright again.

Which of the following relationships is the teacher most likely trying to demonstrate?

- A. Light affects heat.
- B. Wire material affects voltage.
- C. Temperature affects resistance.
- D. Wire diameter affects transformation.

- 32 The diagram below shows a pipe system.



At which of the following points does water flowing in the pipe meet the **most** resistance?

- A. point W
- B. point X
- C. point Y
- D. point Z

Question 33 is an open-response question.

- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 33 in the space provided in your Student Answer Booklet.

33 Fluid systems may be open systems or closed systems.

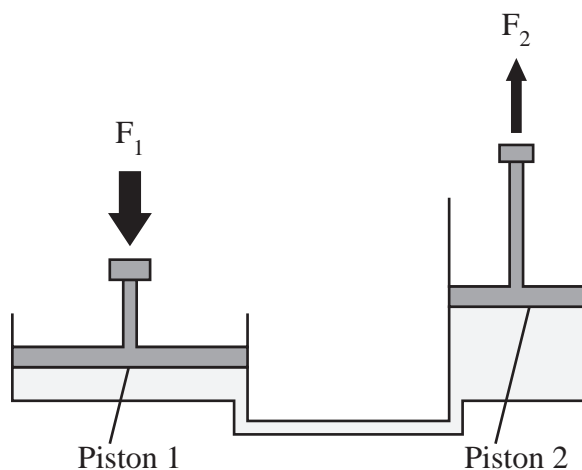
- a. Contrast an open fluid system with a closed fluid system.
- b. Provide one example of a closed system that contains a liquid.
- c. Identify whether the type of fluid in open systems is always liquid, is always gas, or can be either liquid or gas. Provide **two** examples to support your answer.

In a particular closed fluid system a liquid exerts a force of 360 lb. on a piston with a cross-sectional area of 12 sq. in.

- d. Calculate the pressure of the liquid in the system. Show your calculations and include units in your answer.

Mark your answers to multiple-choice questions 34 through 43 in the spaces provided in your Student Answer Booklet. Do not write your answers in this test booklet, but you may work out solutions to multiple-choice questions in the test booklet.

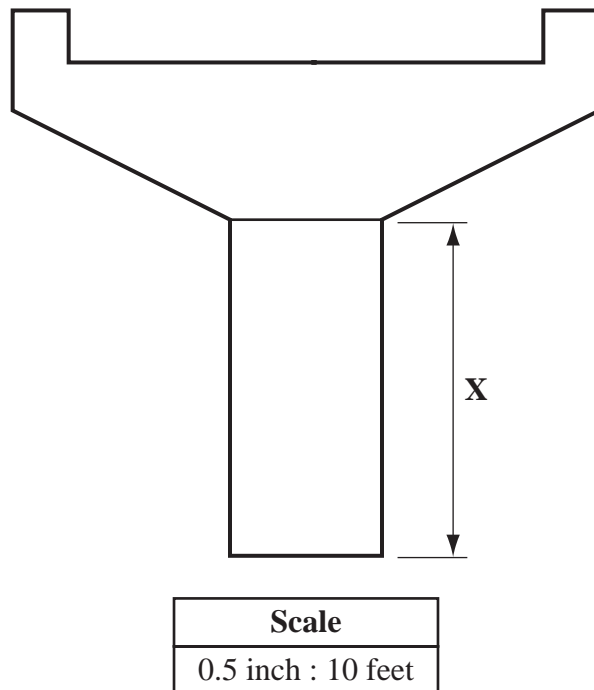
- 34 A hydraulic system with two pistons is shown in the diagram below. F_1 represents the force applied to piston 1, and F_2 represents the force exerted on piston 2.



The areas of the two pistons are represented as A_1 for piston 1 and A_2 for piston 2. Which of the following equations applies to this system?

- A. $F_1 + A_1 = F_2 + A_2$
- B. $F_1 - A_1 = F_2 - A_2$
- C. $F_1 \times A_1 = F_2 \times A_2$
- D. $\frac{F_1}{A_1} = \frac{F_2}{A_2}$

- 35 The diagram below shows a vertical section of a support for a highway overpass.

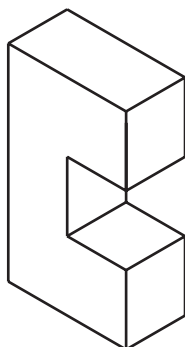


What is the height of the supporting column labeled **X**?

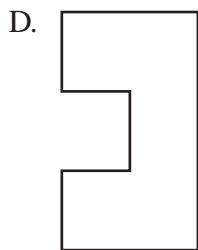
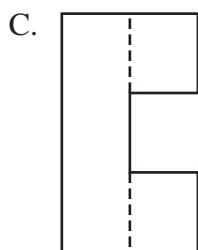
- A. 17 ft. 6 in.
- B. 35 ft. 0 in.
- C. 70 ft. 0 in.
- D. 87 ft. 6 in.

- 36 A company plans to design and manufacture rope that will be used for mountain climbing. Which of the following criteria is **most important** in selecting a material for the rope?
- A. plasticity
 - B. precision finish
 - C. R-value
 - D. tensile strength
- 37 Fiberoptic cables have not yet replaced copper wire cables as the most common means of Internet connection. Which of the following statements explains why copper wires are still used by many people to connect to the Internet?
- A. Fiberoptic cable networks are expensive to install.
 - B. Fiberoptic cables are susceptible to electromagnetic interference.
 - C. Fiberoptic signals cannot travel as far as copper wire signals without significant signal loss.
 - D. Fiberoptic signals travel more slowly than copper wire signals because of greater bandwidth.

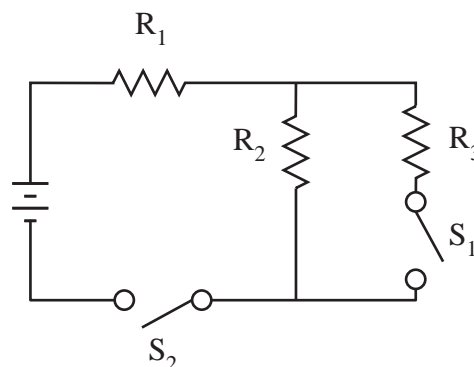
- 38 A drawing of a machine part is shown below.



Which of the following drawings shows the top view of the part?



- 39 A diagram for a circuit with two switches, S_1 and S_2 , is shown below.



If S_1 is left open and S_2 is closed, which resistors will be in series?

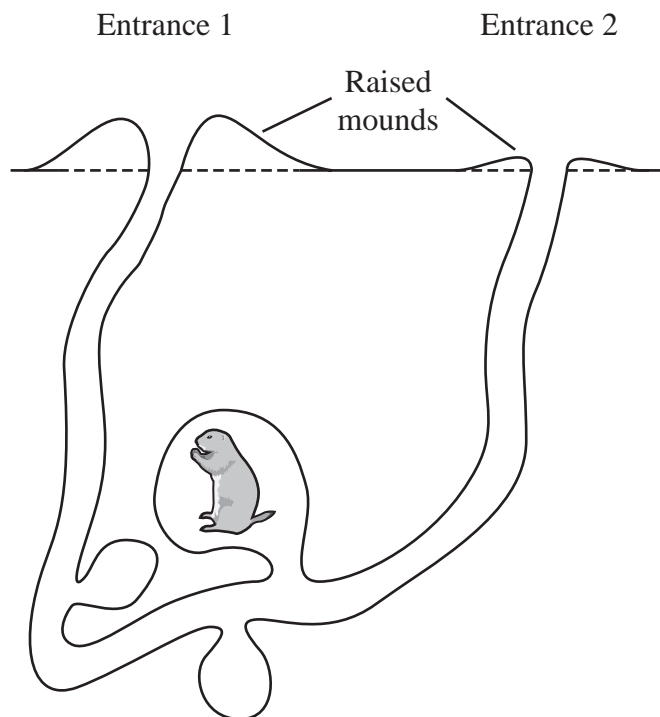
- A. R_1 and R_2 only
- B. R_1 and R_3 only
- C. R_2 and R_3 only
- D. R_1 , R_2 , and R_3

- 40 A bridge is to be built in New England and needs to withstand the region's very cold winters and hot summers. Which of the following properties of steel is **most** important in determining the design of the bridge?

- A. melting point
- B. strain rate
- C. thermal conductivity
- D. thermal expansion

- 41** Building codes in many cities require houses to have at least one open vent pipe that extends from the plumbing system through the roof of the house. Which of the following is a main reason for this requirement?
- A. to protect the house from fire
 - B. to allow fresh air into the house
 - C. to protect the roof from damage
 - D. to allow accumulated gases to escape

- 42 A prairie dog burrow is shown below.



Prairie dogs build raised mounds around both entrances to their burrow. The mound around one entrance is taller than the mound around the other entrance. Because the mounds are at different heights, the air pressure at entrance 1 is lower than the air pressure at entrance 2 when the wind blows. This causes air to flow in at entrance 2 and out at entrance 1.

In theory, the ventilation in a prairie dog burrow relies on which of the following concepts?

- A. Bernoulli's principle
- B. conduction
- C. Ohm's law
- D. pneumatics

- 43 Much of the heat produced by a fireplace is carried up the chimney by rising air. Which of the following processes is responsible for this loss of heat energy to the outside environment?

- A. conduction
- B. convection
- C. evaporation
- D. radiation

Questions 44 and 45 are open-response questions.

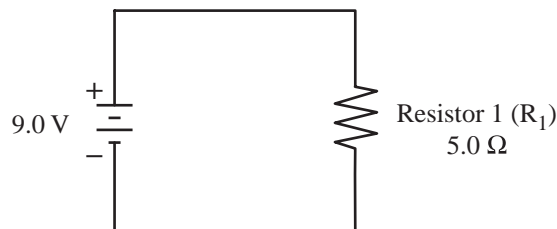
- **BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.**
- **Show all your work (diagrams, tables, or computations) in your Student Answer Booklet.**
- **If you do the work in your head, explain in writing how you did the work.**

Write your answer to question 44 in the space provided in your Student Answer Booklet.

- 44** An automobile manufacturer is considering the use of robotics to paint new cars.
- Provide **one** reason why using robots to paint cars might increase production compared with using human workers.
 - Identify and explain **two** other reasons, besides an increase in production, for choosing robots instead of human workers to paint cars.

Write your answer to question 45 in the space provided in your Student Answer Booklet.

- 45 A diagram for a simple circuit is shown below.



Ohm's law

$$I = \frac{V}{R}$$

Suppose a second resistor (R_2), with a resistance of 7.0 Ω , is added to the circuit in series.

- Draw the diagram for the series circuit with the two resistors. Label the components of the new circuit.
- Calculate the total amount of current in the new circuit. Show your calculations and include units in your answer.
- Calculate the potential difference (voltage) across each resistor, R_1 and R_2 , in the new circuit. Show your calculations and include units in your answer.

Formulas

$$V = I \times R$$

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

$$P = I \times V$$

$$\text{Area of a circle} = \pi r^2$$

Variables

I = current

r = radius

P = power

R = resistance

V = voltage

Definitions and Abbreviations

AC = alternating current

psi = pounds per square inch

DC = direct current

$\pi \approx 3.14$

High School Technology/Engineering
Spring 2012 Released Items:
Reporting Categories, Standards, and Correct Answers*

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
1	388	Engineering Design	1.1	C
2	388	Fluid and Thermal Systems	3.4	D
3	389	Fluid and Thermal Systems	4.2	A
4	389	Construction and Manufacturing	2.4	B
5	390	Electrical and Communication Systems	6.5	C
6	390	Construction and Manufacturing	7.1	B
7	391	Electrical and Communication Systems	5.3	A
8	391	Engineering Design	1.2	A
9	391	Electrical and Communication Systems	5.5	B
10	392	Engineering Design	1.3	B
11	393	Engineering Design	1.2	
12	394	Fluid and Thermal Systems	3.1	C
13	394	Fluid and Thermal Systems	4.3	C
14	394	Fluid and Thermal Systems	4.4	A
15	395	Engineering Design	1.4	C
16	395	Electrical and Communication Systems	6.2	C
17	396	Electrical and Communication Systems	6.3	B
18	396	Engineering Design	1.1	B
19	396	Construction and Manufacturing	2.2	A
20	397	Construction and Manufacturing	2.5	B
21	397	Fluid and Thermal Systems	3.2	B
22	397	Fluid and Thermal Systems	3.3	C
23	398	Electrical and Communication Systems	6.3	
24	399	Fluid and Thermal Systems	4.2	C
25	399	Fluid and Thermal Systems	4.4	B
26	399	Fluid and Thermal Systems	3.2	A
27	399	Electrical and Communication Systems	6.1	A
28	400	Engineering Design	1.5	C
29	401	Fluid and Thermal Systems	4.3	D
30	401	Electrical and Communication Systems	5.2	C
31	402	Electrical and Communication Systems	5.4	C
32	402	Fluid and Thermal Systems	3.5	B
33	403	Fluid and Thermal Systems	3.1	
34	404	Fluid and Thermal Systems	3.3	D
35	404	Engineering Design	1.4	B
36	405	Construction and Manufacturing	7.2	D
37	405	Electrical and Communication Systems	6.4	A
38	406	Engineering Design	1.3	A
39	406	Electrical and Communication Systems	5.1	A
40	406	Construction and Manufacturing	2.1	D
41	407	Construction and Manufacturing	2.6	D

Item No.	Page No.	Reporting Category	Standard	Correct Answer (MC)*
42	408	<i>Construction and Manufacturing</i>	2.3	A
43	408	<i>Fluid and Thermal Systems</i>	4.1	B
44	409	<i>Construction and Manufacturing</i>	7.3	
45	410	<i>Electrical and Communication Systems</i>	5.1	

* Answers are provided here for multiple-choice items only. Sample responses and scoring guidelines for open-response items, which are indicated by shaded cells, will be posted to the Department's website later this year.